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Mr. Thomas Ruſsell

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AGRICULTURE

OF

SURREY, &c.

A
COMPENDIUM
OF
MODERN HUSBANDRY,
PRINCIPALLY WRITTEN DURING A SURVEY
OF
SURREY
Made at the desire of the Board of Agriculture;
Illustrative also of the best practices in the neighbouring Counties,
KENT, SUSSEX, &c.

IN WHICH IS COMPRISED
AN ANALYSIS OF MANURES
Shewing their Chemical Contents, and the proper application of them
to Soils and Plants of all descriptions.

ALSO
AN ESSAY ON TIMBER
Exhibiting a view of the increasing scarcity of that important Article, with
Hints on the Means of Counteracting it;

TOGETHER WITH
A VARIETY OF MISCELLANEOUS SUBJECTS
Peculiarly adapted to the present state of the Internal Economy of the
Kingdom.

BY JAMES MALCOLM,
Land Surveyor to their Royal Highnesses the Prince of Wales,
and the Dukes of York and Clarence.

VOL. II.

Argumentum locuples habui. *Strada Prol. Acad.*
Res spectatur non verba. *Cic.*

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1805.

AGRICULTURE

OF THE

COUNTY OF SURREY.

MANURES.

HAVING intended to have given a chapter in illustration of such parts of the system of chemistry as relate either immediately or remotely to agriculture, I have on more mature consideration withdrawn it. I proceed, therefore, to consider the several sorts of manures which are actually employed at this time in the county, either as stimulants or correctors of the several soils to which they are applied; together with such other kinds as from my own experience and observation, or from the most respectable communications, I should recommend to be occasionally introduced.

It will not be deemed necessary for me, I presume, to expatiate upon the advantages to be derived from a judicious application of manures.

Their importance in husbandry is admitted as well by the farmer of 1000 acres, as by him who occupies but 30 acres. Even the very boy who drives the plough is not ignorant, that the farmer who dresses his land best, and keeps it cleanest, has

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in general the best crops. The operations however of them, and their application to the different sorts of soil for all the variety of grain at different seasons of the year, are but little attended to, even among farmers who deservedly rank high in the profession.

Within a day's journey of London, and within a short distance of Kingston, Chertsey, Guildford, Godalming, Reigate and Dorking, or any of the larger villages, it is no unusual thing to see a number of large mixens and dungheaps upon the different wastes, by the road side, belonging to the neighbouring gentlemen or opulent farmers.

In the environs of the metropolis, those mixens are either the produce of St. George's Fields, within the Borough of Southwark, and a compound of horse-dung, cow-dung, refuse of slaughter-houses, night soil, sweepings of the streets, and whatever else the filth of London may afford to the scavenger; or they are the produce of the livery stable, the hackneyman's stable, the gentleman's stable, the carman's stable, or the tradesman's stable; whichever of these the mixen may be composed of, and it is material to know, the contents will be of more or less relative strength and goodness. To these the purchasers add an indeterminate quantity of road scrapings, of fresh soil from wastes, of weeds and rubbish, with the addition sometimes of chalk, of cinder ashes from their own houses, and oftentimes the contents of their own farm yards; these several articles compose more or less those mixens I have spoken of.

In no one instance, however, have I been able to find any thing like system in the mechanical arrangement of the component parts of these mixens, and therefore whenever I have enquired as to the proportionate contents of them, the answer has generally been, that they were made according to circumstances, and without any rule; and hence it must follow, that the real value of such a heap is completely unknown to the farmer, consequently he has no guide to determine scientifically, the proportion he ought to allow for the different sorts of soils, or the different sorts of grain, or the particular seasons of the year in which they are applied. For example, a dunghill composed altogether of dung, produced from those stables where post horses and machine horses are kept, and which are plentifully fed with the best oats and beans, must be in every point of view far superior to the mixen composed of dung, made from animals fed with but little corn, indifferent hay, straw, chaff and haulm, let the rest of the compound be what it may, with the exception of night soil, hog dung, and a few other ingredients, which, however, seldom make up the contents of those mixens; yet so little is this very material point attended to, that we frequently see and hear of so many loads of dung per acre, being laid on the land, not according to the quality of the manure, nor according to the state and condition of the soil; but so many loads for wheat, so many for turnips, and so many for grass. To what cause shall we attribute a circumstance like this, so full of inattention, and so out of all character? It must proceed, I apprehend, from that total absence of system and science, which so uniformly prevails throughout the profession.

One would naturally suppose, that nothing would strike a man with greater force, than that if one acre of land of a certain quality required thirty cubical loads of dung of the first quality, it would require 35, 40, or even more according to the relative goodness of each of the materials with which it was composed, in order that the latter may be said to contain an equal quantity of pabulum with the former. Next to this want of skill in the application, is that uniform absurd mode of letting the dung remain all the winter and spring in the farm yard, trodden under foot, saturated with wet, and there rotting, or else lying upon a hill and quite dry, without once undergoing the smallest sensible fermentation, and as if that was not sufficient to injure it, it is thrown up in the spring into heaps in the yard, there to drain out the moisture from below, which becomes entirely lost, and to expose a high surface to the drying winds and sun, to extract and evaporate what little goodness there may be left in that part: and lastly to complete this system, it is afterwards carted out, again left in heaps in the field for weeks, to the exhaustion of almost every particle of mucilage that might have remained in it, and to the injury of the crop wherever those heaps have stood. So far do we see men lose sight of their most essential interests for want of that knowledge of the science which is so necessary to govern all their proceedings.

Another error, no less glaring than the former, arises from the manner of carting out the dung to form the heap. In the first place, the dung is generally drawn upon the heap, shot down, and carelessly spread. The heap is made longitudinal, highest in the middle, and brought down to nothing at each end, for the more easy ascent and descent of the cart and horses; the consequence of such a proceeding is as evident as it is absurd; for as it is not possible to draw load after load, upon such a heap without compressing those parts where the horses tread and the wheels go, (to say nothing of the injury it does to the cattle by the violence of the exertion,) so, instead of the dung's undergoing a regular fermentation, which every part would necessarily, if the dung had been thrown loosely on the heap, and of one uniform thickness and height, instead of being shot out of the cart immediately upon it; part of it, therefore, heats and purifies itself, while the rest either from being too much compressed, or being too thin, takes to moulding for want of air, caloric, and moisture, acquires a musty turbid smell, generates fungi, and is in that state injurious to vegetation. In the second place, when this heap comes to be turned over, which (strange as it may seem) is never attempted to be done until the heat is quite spent, its fermenting state gone by, and it is become entirely putrescent, all the symptoms I have described plainly discover themselves. If to this heap any extraneous substances have been added, such as fresh soil, chalk, ashes, or what not, and having been thrown on in the usual way, and the heap is not turned over until the heat is quite spent, and very often they are not put on until the heap is quite rotten, (as I have lately witnessed,) what possible benefit or advantage can arise to those substances by being laid on the dung and afterwards mixed with it? but admitting that it is of service to any of those substances, does not the manner in which those heaps are always turned prevent the proper and full effect of it? and why does it prevent it? because in the first place, the master is generally as ignorant of the proper time and manner of doing it as the man; and secondly, the laziness and carelessness of the servant, will, if not narrowly watched, baffle the best intentions of the master in many cases. In turning it, therefore, we find them beginning at one end, and throwing layer upon layer as they cut them through, place them again in the order they found them, with this difference only, that the part which was before at the top now becomes the bottom, and the bottom in course forms the top; instead of shaking it all up, breaking the clods and lumps and separating the adhesive parts of the dung as every gardener would do for his frames, or as a nurseryman would do his different sorts of soils for his foreign plants. Thus, therefore, the benefit that might have accrued to each ingredient by a proper admixture of them together is infallibly lost, because the dung has been prevented from infusing any of its saline particles to the mould, and the chalk has been prevented from promoting the putrefaction of the dung, and therefore, when they come to be laid upon the land, instead of being a body of invaluable manure, they are little better as such, than if each ingredient had been immediately drawn from the beds they were originally taken from. This is no strained or forced account. I could literally name the farms where these practices are usually pursued, but as they are more or less so throughout the kingdom, it would be invidious to particularize those of this county only.

Our next observation applies to the farm yards. To the practices above related, we have to add the uniform condition of most of the yards, which are either so full of large holes and consequently uneven, or they are situate on the side of a sharp declivity, by which means all the moisture, whether it be urine or water, inevitably drains from it, or the bottom is so porous as to draw off the greater part of the moisture, leaving the straw saturated in some places and perfectly dry in others; whichever way it is, the loss cannot but be very considerable to the farmer, although he may be ignorant of what he is daily losing, because it does not go out of his pocket in the shape of hard cash. Whenever a yard is circumstanced in either of the ways just mentioned, every farmer can, if he pleases, level all inequalities, and he can make the bottom sound and water tight; and although he cannot perhaps remove his yard from the side of the declivity, he may with little trouble frequently move the litter about from the upper to the lower side, and vice versa, that the whole may be moistened, and when it has once regularly and sufficiently been so, he can (as he ought) clean out his yard, and remove its contents to some perfectly level and shaded or sheltered place, where he can throw it up loosely together, and thereby make up by a little addition of trouble for the unfortunate defects of his yard. In fact, allowing it to be of the very best shape and situation, I am well convinced from my own practice as well as from daily observation, that every yard in which stock are almost constantly kept should be cleaned out once a month at least, not only to sweeten it, and thereby increase the health and vigour of the animals, but in order that its contents may be properly mixed in some other place to induce and bring on a regular fermentation, and consequent putrescence, if it is to be so used.

Dung so made, and placed in a situation where the violence of the sun's heat, or the effects of the drying winds are as much as possible prevented, will be of the best quality consistent with the nature of its produce; but it should by no means be suffered to spend its heat, before it is turned over with forks, and as well shook up and mixed together as if it was intended for a cucumber-bed, and should any part of it be so dry as not likely to ferment; the moist part should be mixed with the dry, and if necessary, such parts should be sprinkled with water as it is shook up, and with a water-pot having a coarse rose to it at the spout. Perhaps I may be told that this additional labour and trouble is what no farmers either can or will like to do that have much business; they may also think that it will not pay them for their trouble, which indeed is their general reason for not attending more to this subject than they do; to which I answer, if it was worth the trouble to collect the dung at all, it certainly is equally so to make it of the utmost possible value, and that is only to be effected by the mode I have prescribed; besides, have we not cases in point to prove that the effect is worth the trouble, and a great deal more than they are ever likely to bestow upon it? Does not every kitchen gardener do it? And does he not find his advantage in the practice to be so great, as on no account whatever to omit it? And as it is admitted on all hands, that no dung is so good in every point of *view, as that* which they use, and upon the good-

ness of which the superior excellence of their crops depends, it cannot, I presume, be saying too much, by insisting upon the practice being so much more necessary to be strictly attended to by every description of farmers, whose dung, prima facie, not being of so strong a nature, necessarily requires more attention to supply the deficiency.

The following is a List of such Manures as are either in use or recommended.

1 Horse dung,
2 Cow dung and bullock's dung,
3 Farm yard dung,
4 Hog dung,
5 Night soil,
6 Chalk,
7 Lime,
8 Gypsum,
9 Marl,
10 Bones,
11 Talk,
12 Furriers' clippings,
13 Woollen rags,
14 Horn shavings,
15 Tanners' bark,
16 Fellmongers' cuttings,
17 Boiled hops, and refuse from the breweries,
18 Sugar scum,
19 Cleanings of ditches,
20 Mud from ponds,
21 Sweepings of streets, and scavengers' stuff,
22 Scrapings of roads, and drift sand,
23 The rubbish from old buildings,
24 Sorrel.

Top Dressings employed as Promoters of the growth of Corn and Grass.

1 Soot from sea or pit coal fires,
2 Soot from wood fires,
3 Soot from turf and peat fires,
4 Malt dust,
5 Soap-boilers' ashes,
6 Wood ashes,
7 Furze ashes,
8 Turf and peat ashes,
9 Cinder ashes.

HORSE DUNG.

Having given in the preceding account a general outline of the sorts of manures which compose those heaps or Mixens which are dispersed over particular parts of the county, I will consider each subject in the order I have placed them, in a more scientific way, in order that we may understand something of their component parts, by which means we shall have no difficulty in applying them in a more economical manner than is usually practised.

In order to prepare dung for putrefaction, three things are absolutely necessary, i. e. Air, Caloric, and Moisture.

When the straw, haulm, and the droppings from the horses, either in the stables or in the yard, or in other words, their dung and urine have soiled of its gas its so trifling as only to be distinguished by its smell; putrefaction does not however commence until the effects of fermentation have ceased, when the whole becomes reduced into a solid mass. Notwithstanding the heat, or what is the same thing, the fermentation has so far ceased as scarcely to be discoverable by the feel, it is nevertheless only suspended, for if it is turned over, under those favourable circumstances that first gave it the fermenting power, a fresh heat is generated, and the process is continued until the whole is decomposed. This decomposition or residuum is carbon, phosphat of soda, and lime; some carbonated hydrogen gas, extract, and fat.

In order to render this fermentation regular, it must be turned over, and it will then be seen very distinctly what parts of the dung are too dry, and these should be so distributed among that which is moist, as that the whole at its second fermentation may heat alike, and if it is not likely to do so from a defect of moisture, a gentle sprinkling of water should, from time to time, be given it in the evening, until its appearance exhibits every symptom of a regular fermentation; and it is no bad plan for a farmer who wishes to do things scientifically, to thrust a few sticks of the size of common broom handles into different parts of the heap, there to remain as indicative of the manner of its heating, which he will be able with the greatest accuracy to ascertain, and by timely supplies of water to bring on a more certain and rapid fermentation in those parts, which may stand most in need of it. Being thus treated, and regard being had to its temperament from time to time, by means of these sticks, it will be found that a farmer instead of having one dung heap from his yard in the course of a season, which is usually composed of the rotten, the dry, the mouldy, and the half rotten, may every nine or ten weeks have a lot of dung of the very first quality, fit for any purposes that may be required, and such as he cannot obtain in the present slovenly way in twelve months. If the dung is procured from stables where the horses are highly fed, and it is suffered to be over putrid before it is used, it becomes then a forcing manure from the great quantity of alkaline salts which it contains, and consequently is found to increase the powers of putrefaction in the soil to which it is applied; it therefore does not nourish the soil, by entering by slow degrees into its combination, but prepares the mucilage already there, to act as stimulants to the roots of those plants which are substances, should be laid in this foundation from 18 inches to 2 feet thick, after having been previously pulverized, care being had in digging this soil, to throw aside all dock roots, as well as those of any noxious weeds; the dung may then be brought, and always shot down by the side of the heap, (and never carted on it) which a man will carefully shake up, and distribute over the whole heap, as far as he conceives there will be dung enough to raise the mass at least four or five feet thick of dung; round the outsides of this heap a wall of the same mould as is laid on the foundation, should be raised, of the height of the dung, and two feet in thickness, as well to prevent the drying of the outsides of the dung, as to prevent the total loss of the liquor that may draw from it during its fermenting. As soon as the heap has begun to ferment regularly, and not before, which will visibly appear by its sinking and steaming, but very correctly by the sticks I have before recommended to be used, a thin coat of the intended soil must be thrown over it, which may be repeated in a few days until it has attained a thickness of about 12 or 14 inches. This soil of whatever nature and quality it may be, must invariably be pulverized, and be made as fine as possible, to render it less ponderous, and to make the weight of it more equal over the heap, before it is thrown on. In course, the usual mode of putting on the soil in those large lumps in which it is dug, is uniformly to be avoided, because it is impossible to cover the surface of the dung of an equal thickness with them, and because their cumbrous weight would compress the dung in holes, and prevent the regular fermentation of the whole. When treated in the manner I have directed, the steam, or elastic fluid, will diffuse itself regularly through the soil, and it will thereby be duly impregnated with a considerable quantity of azotic or phlogisticated air, which proceeds from the decomposition of those organic bodies, of which the mixen is composed; and of the very first consequence to its success as a manure.

As soon as the heat begins to decline, the whole should then be turned over, beginning at one end, and shaking up the dung and soil together, clean to the bottom of the heap; breaking any little clods, and carefully separating those parts of the dung, that may cohere together, and applying a good sprinkling of water, with a large water-pot, to every dry part. When the mixen has been turned over, it should have a fresh wall of earth added to it, as before, and left to ferment, which it will immediately begin to do, if care has been taken to throw it up light, and to supply the dry parts with a due quantity of moisture; if it does not, it must proceed from some of these causes, either that it was too far reduced to a putrescent state, and consequently its powers of generating caloric totally spent, or it is too dry, which an additional watering or two would speedily remove, or it is too much loaded with soil, in proportion to the quantity and body of the dung; it is always to be observed as a guide for determining this quantity, that the stronger and denser it is, the less must be the quantity, and vice versa.

With respect to the long contested question, at which state of the dung it is most fit to be used, and as containing the greatest quantity of the food of plants; and as it is a point of the utmost importance to agriculture, I shall endeavour to place it in a clear point of view, in order that every farmer may reason upon it himself, and be able to decide a point, which, in my humble opinion, ought long since to have been at rest.

I have already said that dung over putrid, or, in other words, completely rotten, is a stimulant or forcer. Of this there can be no question, since it is universally admitted, that its essence is exhausted by the first crop of grain that it produces, although it is not so much so by a leguminous or gramineous crop, but may bear out a second.

Long Dung cannot be in a fit state for any crop, (not even potatoes, as will be hereafter clearly shewn) because, in the first place, it is more apt to grow mouldy than to rot, for want of a sufficient body to produce competent fermentation in the soil; and a state of mouldiness is so far removed from engendering those saline particles that are to promote vegetation, that we oftener find it communicating the very same disorder to the roots of plants, turning them blue, or grey, or white, according to the greater or less prevalence of the mouldy state of the dung, and consequently must be injurious to vegetation.

Long dung is not fit to be used upon any light soil, not only on account of the before-mentioned reason, but because it tends to keep that light and hollow, which is already too much so; and as it is well known to be a great encourager and harbour for grubs, slugs, and the whole tribe of animalculæ which are so destructive to the roots and tender leaves of vegetables, this state of the dung in such soils cannot have one property to recommend it, while there is every reason and possible objection to be urged against it.

Even upon the strong soils its application comes in a very questionable shape; supposing the land to be very cohesive, it ought to be laid on some months before the seed is wanted to be sown, immediately ploughed in, and during the period of its transformation, it ought to be frequently ploughed, harrowed and torn about, (indeed it should never lay still) in order that the straw may be the more intimately mixed with the soil, as a means of keeping it open, and breaking its tenacity, thereby permitting the more general admission of the atmospheric air to separate and pulverize its several parts. The portion of alkaline salts which in its long state it can have acquired, must be but few, its vegetative powers quickened, for want of that fermenting state which would otherwise have destroyed them.

The proper state, therefore, in which dung should be used, to obtain the full effect of its alkaline powers, both as to present and more distant benefit, is precisely at that period when fermentation ceases, and the heat is spent, after the second turning; it has then undergone the saccharine, vinous, and acetous fermentation; and should be applied to the soil as soon as possible, because every part is then saturated with the gaseous fluid, and in full possession of all the virtues of the animal and vegetable substances thus decomposed.

I know it may be objected, that a farmer cannot always have his ground ready to receive the dung exactly at the period when the dung may be in a fit state to be carried on the land. I think, however, generally speaking, and with attention, he may Let us see the seasons of sowing, and examine how far it can be done according to the preceding observations.

I will suppose all his spring corn sown, and his farm yard cleaned out, with a heap of dung prepared for turnips, and another or two preparing for wheat; if he sows his turnips in May or the beginning of June, he will probably put on his dung in April, and plough it in; the dung that is for his wheat, being now in a state of preparation, and as it is not usual to cart it on the land before July, there is ample time for its being rendered complete in all its parts of fermentation. Between July and February there are six months to provide against the barley season; and allowing for the two months of August and September, when the stock may be out of the yard, there will then be four good months to prepare dung for that season; and from February until May, he may surely contrive to get another ready; we therefore see, that by such a practice, three distinct portions of dung may be made from one yard with the same quantity of stock, supposing it to be fully stocked in both cases, in one year; containing more real mucilage, perhaps more cubical loads of manure in each of these portions, than is made in the usual manner, during the whole season.

There is no Kitchen Gardener of any skill and repute, but who contrives to get his dung ready fermented, and fit for use for every crop he has to put out, and never lets the crop wait for the dung; the number of his crops are besides in the proportion of almost ten to one; surely then, what is to fore, as we are in the dark with respect to this point, I think it right to submit some general ideas which the intelligent practitioner will necessarily apply discretionally.

Table of the usual quantities of Dung laid upon the different sorts of Soil.

Upon strong lands, for	wheat	30	loads per acre.
Ditto	barley	25	ditto.
Ditto	turnips	30	ditto.
Ditto upon	clover for wheat	20	ditto.
Ditto	pasture	15 to 20	ditto.
Upon medium loams, for	wheat	20 to 25	ditto.
Ditto	barley	20	ditto.
Ditto	turnips	20	ditto.
Ditto upon	clover	15	ditto.
Ditto	pasture	15	ditto.
Upon gravelly ditto, for	wheat	25	ditto.
Ditto	barley	22	ditto.
Ditto	turnips	25	ditto.
Ditto upon	clover	20	ditto.
Ditto	pasture	16	ditto.
Upon chalky ditto, for	wheat	20	ditto.
Ditto	barley	16	ditto.
Ditto	turnips	20	ditto.
Ditto upon	clover	16	ditto.
Ditto	sainfoin	20	ditto.
Ditto	pasture	16	ditto.
Upon sandy soils, for	wheat	20	ditto.
Ditto	barley	18	ditto.
Ditto	turnips	20	ditto.
Ditto upon	clover	16	ditto.
Ditto	pasture	16	ditto.

Chemical Table of Contents of Horse Dung in 105 *lb. according to Ruckert.*

	Heavy inflam. Air Cubic Inches.	Fixed Air Cubic Inches.	Water lb.	Coal lb.	Calx and Magnesia lb.	Argil lb.	Silex lb.	Fixed Salts lb.
Fresh Horse Dung	....	...	88.	10.2	1.5	0.5	3.	0.21
Earth resulting from rotten ditto	1.64	1.	38.15	18.75	6.2	1.5	23.43	....

COW DUNG.

The dung from cows and neat cattle kept in the yard and fed upon straw, haum, &c. is essentially different in its quality from that which proceeds from those that are stall-fed, either in the cow-houses, or at the distilleries. The former kind of food being of a dry, meager, and, generally speaking, of an innutritious nature, cannot produce a in greater proportion; and, therefore, the dung as well as the urine will be found to contain a greater quantity of Azot, Hydrogen, Oxygen, and Carbon, than in the former; the exact comparative proportion I have not ascertained, but I have so often tried both, weight for weight, in the growth of plants, that I am satisfied of the fact. The dung of all ruminous animals, or those which chew the cud, as it does not contain much indigested matter will scarcely ferment; I say scarcely, for in every attempt which I have made (and I have formerly used several hundred loads) it has almost uniformly failed, which I take to proceed from the want of air, either fixed or inflammable; for moisture and air will generate heat in all or most other animal and vegetable substances when combined; so it would seem, that the absence of this fluid, and the presence of so great a portion of moisture, dispose the dung to a state of almost absolute inactivity. Could the superabundant moisture be extracted without impairing the virtues of the dung, its weight would be so much lessened, air would supply the place of the moisture, caloric would ensue, and consequently a fermentation would arise, which would produce that complete change, as to render it one of the most valuable manures yet known. Its great objection, at present proceeds, from the want of fermentation to destroy the seeds of weeds, which it very much encourages, and with which the food of these cattle in general abounds that are fed in the fold yard or in pastures, they pass through their bodies entire, but in an increased vegetative state, and so far renders this dung of less value than that of the stall-fed ox; even the state of putrefaction to which it passes, if left long enough, only serves to give additional strength to the seeds of weeds.

This dung is very much used by the farming gardeners, many of whom are great cowkeepers in Lambeth, Camberwell, Peckham, and Battersea Parishes, generally by itself, as all the horse dung they make and buy they use for their frames; the cow dung is applied to raising of turnips, rye, tares, cabbages, wheat, beans, peas, or oats, as well as for their pasture; as every thing is drawn off their land and nothing consumed on it, they generally manure for almost every crop, as I shall have occasion to shew hereafter. It is used in almost every state, I mean from its raw state, and immediately from the cowhouses, to its almost putrescent state; this is done not from choice, but

Chemical Table of the Contents of Cow Dung in 105 lb. according to Ruckert.

	Heavy inflam. Air Cubic Inches.	Fixed Air Cubic Inches.	Water lb.	Coal lb.	Calx and Magnesia lb.	Argill. lb.	Silex lb.	Volatile Alkali lb.	Gypsum lb.	Fixed Salts lb.
Fresh Cow Dung. . .	. . . .	. . . .	. .	3.75	1. 2	0. 15	2. 4	. . . .	. . . .	0. 6
Rotten Cow Dung. . .	1360	120	81	10.	3.	0. 6	5	0. 65	0. 9	0. 24

Note, where oil cake makes part of the feed, such dung will necessarily be more stimulating than where hay alone, or hay and turnips compose it.

FARM YARD DUNG.

This dung is a compound of horse dung, cow dung, hog dung, the dung from poultry of all sorts, pigeons, &c. and consequently is a combination of the hottest and coolest manures. If the yard which contains this assemblage is properly disposed, level, and with a foundation perfectly sound and water tight; and if it is well littered down, and after due saturation is cleared out, properly thrown together, and duly fermented, such a body of manure cannot fail of being highly valuable upon any sort of soil and for any sort of crop; because, let the season be what it may, wet or dry, hot or cold, some part of the manure will (if it has been properly incorporated) act as a corrector and have its due effect, that is, if the season is cold and wet, the gas of the stimulating manures, horse dung, hogs, and the poultry dung will be retained in the soil, will keep it warm, and hence nourish the plants, notwithstanding the weather; and if it proves hot and dry, the volatile or gaseous fluid which contains the essence of them, will be prevented from being so soon evaporated and exhausted, by the retentive coolness and inactivity of the cow dung, and the soil that may be mixed with them; thus we see in a very clear and evident point of view, some of the beneficial effects arising from a combination of different sorts of manures.

In the preparation of such a body of dung, to qualify it for entering into the state of fermentation, particular attention must be paid to its primary organization; it will not be sufficient that it is carelessly taken up in the yard in a regular way, and carted to the mixen, there to be shot down and made into a dunghill, no, the yard must be looked over, a superabundance of any one sort of dung must not at any one time be put into the cart, (at least as near as can be judged,) but a little of each in equal portions, so that when it arrives at from the state of the atmosphere, and the state of its moisture, caloric takes quick possession of every part of it, it should be soon lightly covered with peat earth, or any soil not so dense or ponderous as clay, properly pulverized to receive the whole of those volatile ingredients, and to prevent the total loss of them by exhalation. For as the gaseous fluid contains no small portion of the component parts of the dunghill, (this is a species of distillation,) it is evident that to let it pass away without acquiring every possible advantage from it, would be the same as to give away the spirit, and to retain only the residuum or lees; that this is the true state of the case, we have only to refer to the primary consideration of the several ingredients of which the dung heap is composed, which we shall find to be vegetable. If then these vegetables, after passing through the body of the animal, and having afterwards undergone the putrescent state, which cannot have altered their respective combinations, but have formed them into new ones, it will then follow as a necessary result, that what is thus evaporated by that decomposition, and being a part of the combination, must actually be nothing else than the pabula of plants, and therefore, to part with these is to give away so much of that food of which we are continually complaining we have not enough.

Instead of looking upon this exhalation then as we usually do, in a very insignificant way, and as in proportion to the quantity of dung and its propensity to ferment, a greater or less quantity of this fluid is generated, we ought carefully to profit by so favourable a circumstance, and increase by every means in our power the collection of this great body of gas, instead of bestowing our whole attention solely to the residuum as is constantly practised by all descriptions of farmers.

As this body of manure is composed of so great a variety of substances, and all of them strongly impregnated with the carbonic principle, but with different proportions of the other gases, it will follow, that some variation will be necessary in applying it to the several sorts of soils, as to the quantity per acre. But as it cannot vary very greatly from the account already given in the dissertation upon horse dung, it may, I presume, be left to the discretion of the farmer, without further enumeration.

HOG DUNG.

Greater quantities of this very valuable animal he did not know what to do with. Hog dung is composed of an unctuous, saponaceous, stimulating substance, containing much carbonic acid, azot, and hydrogen; when laid up in a heap, a great deal of ammoniac is disengaged, which is distinguished by the senses from the urinous effluvia which is discharged. It generates caloric, but not in so great a degree as horse dung; it is slower in fermenting, and its period of putrefaction is therefore elongated when mixed with any cold, crude, and sour soil; it enters into combination with it readily, separates the adhesiveness of it, and when thus divided, the unctuousness of it clings to the finer particles of the soil, and by its stimulating powers, operates strongly upon the roots of the vegetables. As it never heats sufficiently to destroy effectually the seeds of weeds, it is found upon all soils to be a great encourager and increaser of them; it, therefore, should always be applied upon land that is intended for a drilled crop, but it is best when it has been laid up in a mixen with horse dung to have undergone a due fermentation, and regularly mixed with some soil of an opposite nature to that with which it is intended to be applied. I have often seen it applied to land, consisting of a shallow loam upon a fine gravel, and land of a sandy nature; in such a soil, it has filled the land with weeds, particularly the May weed, and in a hot season, a crop of barley has been entirely burnt up; it follows from thence, that such soils are by no means proper for this manure. In its simple and unmixed state, it is usual to apply

for Wheat	20	loads	per acre.
Barley..	14	ditto	..ditto
Turnips	16	ditto	..ditto
Pasture	10	ditto	..ditto

NIGHT SOIL.

It is only of late date that this inestimable manure has been much sought after by the farmers of this county, great quantities of which are collected by the scavengers of London, and deposited in St. George's Fields as the receptacle for the metropolis. Upon the thin chalky soils between Croydon and Godstone, we find it getting into use; sometimes it is laid on in its raw state, at others after having been exposed to the air and the greater part of the urinous matter evaporated; it is sometimes in so loose and watery a state, that the farmers are obliged to lay a thick foundation of litter, and to inclose it on its sides with some retentive soil, to prevent the loss of so much of it as would otherwise sink into the earth. It is used as a dresvantage. On this thin, chalky soil, his custom is to draw it on the land in the same state he brings it from St. George's Fields, which he procures as dry as possible, laying on three waggon loads to the acre, which is immediately spread and ploughed in directly with a shallow furrow, and sowed as soon as ploughed; it costs 7s. per load in St. George's Fields, and if he went empty to London, it would stand him in two guineas per load, but as he always carries hay, straw, or corn, it may be said to cost him one guinea, which necessarily produces an expence of three guineas per acre; he sometimes lightly folds his land with sheep for turnips, and afterwards, applies two loads of this manure per acre, which he thinks a very good practice, as not only making both go a great deal further, but as tending to furnish a greater variety of food for the crop that is to be produced.

The constituent parts of night soil, are carbon united with hydrogen, its effluvia during putrefaction is very considerable and fetid, and arises from the disengagement of the great quantity of ammoniacal gas with which it is charged; if a certain quantity of quick lime be thrown upon it or mixed with it, it decomposes the mass, the nausea is discharged very quickly from the excremental part, the urinous particles are completely absorbed, and the whole body of it will be left nearly or quite dry, and without retaining scarcely any portion of its offensive odour. As it is very difficult to procure this manure in any other than a liquid state, it becomes necessary to make every preparation for the securing every part of it; a mixen of fresh loam, peat, decayed tanners bark, or any such like substance, and lime bids the fairest to answer the intended purpose. A foundation of either of these substances, therefore, being made about two feet deep, the night soil must be drawn to the side of the intended heap, and with scoops, carefully thrown over it to a determinate thickness, next a layer of quick lime; after this a fresh body of loam, peat or bark, night soil, and lime, in the same order and proportion as before, until the whole quantity has attained the proper size of a mixen. To every waggon load of night soil, containing as much as four horses can fairly draw, must be added, five waggon loads of loam, peat or bark, and about forty bushels of quick lime; this proportion having been once regularly turned over and mixed, will be sufficiently dry to use as a top dressing for wheat or barley in the spring, and will be found enough for one acre, and in this way I should be led to suppose, that its properties as a manure, (if it is any) were thoroughly understood by those farmers who make the distinction; that is, however, not the case; because their knowledge, as they confess, is absolutely confined to the distinction of free chalk and hard chalk. Whatever chemical differences or properties, therefore, may be found in them, which alone should fix the discriminating quality, and enable the farmer to judge of the necessary number of bushels to apply to each peculiar soil per acre, he is for want of that knowledge always obliged to trust to chance, and thereby putting either too much or too little on his land; but supposing him from long experience to have discovered the exact quantity for his own soil of some particular chalk; his knowledge can only be local, and he cannot decide a question with any other chalk, in any other soil and situation. As this county not only contains a great tract of chalk hills, which divide it longitudinally into two parts; but also possesses soils extending from the base of those hills to the southern and western extremity of it, which are peculiarly proper for all calcareous manures; it will almost follow as a consequence, that chalk, either native or calcined, is used to a considerable extent; it is but seldom, however, that we find it applied upon so large a scale in its crude state, either for arable or pasture land, as in Hertfordshire; it is almost invariably mixed with dung and earth, but under no proportionate rule; and when so mixed, it is indiscriminately applied to the strong soils, as well as to the lighter soils; that this conduct is completely erroneous, we have only to shew by a short analysis, that chalk uncalcined, being saturated with carbonic acid gas, tends to alter the original disposition of the parts of the soil, where it meets with various substances, either vegetable, animal, or mineral; these substances becoming oxygenated by their action with the chalk, generate their several acids, and these acids disengage the carbonic acid gas, which is readily absorbed by the roots of the plants, it therefore tends, by slow degrees, to separate the cohesiveness of the strong soil, and to admit the roots of the plant to feed upon the carbon with greater facility. Now, the alloy of most chalk is argillaceous, and some of that which I have found contains a great deal, at least one-third of it; whenever that is the case, such chalk is more fit for the light loams and sandy soils, which it would tend to unite, than the other, which is much more calcareous, and conseupon pasture, it should from time to time be well bush harrowed, to prevent its over doing some parts, and under doing, or not chalking at all other parts.

The practice of chalking land is getting very much out of date with the tenantry of the county. Its operation is said by some farmers, to be so very slow and latent, as not to be worth the risk, and only fit for the land owner, while others condemn it, and insist that it only acts to the prejudice of the land.

The farmer argues that when the land has undergone a good summer fallow, it is usual to lay on from 500 to 600 bushels of chalk, in the same state it came from the pit, which, after being regularly scattered about, is ploughed in shallow; it is afterwards landed up, and sown with wheat, the produce from this crop, is said by them, to be the effect of the summer's fallow, rather than from the chalk, because the return may not be greater than is usually obtained by a fallow only; and may fall short of that which has been manured with dung upon the fallow; after wheat, it is usual to sow oats upon once or at most twice ploughing; but as the land is never harrowed between each ploughing, in course the chalk is only turned over, but never separated or pulverized. The next course is a winter and summer fallow, according to the old custom of the country; but if a third crop was taken from it, the chalk would still remain unseparated, and only turned over, proceeding, therefore, with the fallow, they seldom begin with it until all their Lent corn is sown; or if they do, it is at some spare interval between their bean and oat season; it therefore turns up solid and hard, and in such large cakes, as no harrows (even if they were inclined to try them) could touch or break; being thus exposed to the drying winds of March, and perhaps April, before another ploughing takes place, the chalk becomes dried in the soil, and together form a mass, which no instrument can separate; indeed the chalk stones serve to hold the soil more closely together than it would have been, if there had been no chalk at all. To roll it, even at the most fortuitous period, would only serve to compress the whole into the earth, without dividing or breaking it, and which the harrows afterwards could not act upon; but, should the period of seed time either be wet, by which the whole would inevitably run together and destroy vegetation, or if it proves dry, a great portion of the seed would not be covered, and much of it would thereby be lost, its vegetation the crudities and acidities of them; by this peculiar property the very nature and quality of the soil must inevitably be changed, and although it may be some time in effecting so great a change, it is evident that it does do it, as is uniformly seen by the alteration and improvement which it makes upon grass, bringing it from a state of coarseness and rushlike appearance, to that of the fine, sweet, and more delicate herbage.

If the soil is deep, and full of vegetable matter, it enters into combination with it, and brings on that state of putrefaction which we stand so much in need of. If the soil is thin, but strong, as in Lingfield parish, upon a sand or iron stone, and short of vegetable matter, the best way to apply it is upon the lay in the autumn a year or two before it is ploughed in, during which time it should be frequently harrowed about, and any large lumps broken in pieces, for it is often observed to become harder by being exposed a long time to a burning sun, and almost to vitrify; by thus laying it on, it will not only render the surface soil sweeter, but will prevent the chalk from working down so fast as it would do if it was laid upon the fallow and ploughed in. If, however, it is ploughed in upon the fallow, after the third or fourth crop, I should recommend to plough in a crop of clover, or buckwheat, which will afford a large portion of mucilage for the chalk to work upon, and bring on such a body of putrefaction, as will insure great crops of corn and pulse for twelve or fourteen years successively; but to effect this purpose completely, a regard must necessarily be had to the quality of the chalk, to the tenacity of the soil, and also to its state of poverty or improvement. In the thin soils before mentioned, which have not been chalked for a number of years, and which, from the extreme tenacity of the substratum, are full of surface springs, the most saponaceous chalk that can be met with, should be selected; if it is laid upon the lay, which is too often foul and coarse, about 450 bushels, reduced as fine as possible, should be put upon each acre, and harrowed about with a bush harrow, but if made into a compost with dung, scrapings of roads, mud, or such like matters, one load of such chalk to three of these will form a most excellent body of manure, but it is not fit to be laid on the land until it has been repeatedly turned over and duly mixed, in order that the chalk may combine with the several substances with which it may be mixed; if yard dung makes ment from vegetable matters decaying in the soil, or from the changes which the carbonaceous matter therein contained may undergo.

When chalk in this manner is rendered soluble, the solution will sink through the surface mould to a more compact stratum, through which it cannot pass. In this situation it will lose the superabundant proportion of fixable air by which it previously became soluble, and will again return to the state of chalk, forming a stratum infinitely more pure and unadulterated than could possibly have been formed, had the process been merely mechanical; in which case, contrary to the fact, all the argillaceous, magnesian, silicious, and ferruginous matters, of equal degree of attenuation, or size of parts, would have sunk with the chalk.

We have hitherto been applying chalk upon the strong soils, but Mr. Logan, Mr. Killick, and some other farmers about Cheam, have applied it with equal success upon the loose, burning, sandy loams in that parish. The chalk was brought from the adjoining parish of Sutton, and from one pit in particular, it was found to be so saponaceous, as to keep the land not only cool, but to increase the tenacity of it in a great degree. In one instance which that gentleman shewed me of a field of garden-pease, which he grew for my father, after a fine crop of wheat, part dunged in the usual way, and part chalked at the rate of 400 bushels to the acre: the advantage was greatly in favour of the latter, both in the quality of the seed, and in the produce. In this county, the chalk is dug from the sides of the hills; in Hertfordshire it is dug out of pits upon the several farms that contain chalk, and oftentimes out of every field upon the farm; in the former case, the farmer has not only to purchase the chalk, but he has the expence of a distant carriage to add; in the latter, it makes part of the contract in the lease, and a pit being sunk in the field, there is only the expence of digging and wheeling, for which, in 1797, I paid seven-pence per load of 40 bushels, half-a-guinea for filling in, and two shillings for sinking the pit; the workmen find the curb, two baskets, each of them holding two bushels, shovels, pickaxe, barrows, &c. In some parts of Kent, when the chalk is dug from the sides of hills, the workmen undermine it for a considerable distance, they then dig a trench along the top, as nearly equidistant from the edge as the undermining extends, the trench is filled with water just before they leave off work in the evening, and during the night, it soaks completely through, when the whole stratum falls at once to the bottom.

When a free saponaceous chalk, like that at Stoke, near Guildford, at Reigate, at Godstone, and some of the other pits in the county is laid upon coarse sour pasture, or upon grass land that has been long neglected and overrun with moss, small chalk regularly spread over it at the rate of 160 to 260 bushels per acre, will effectually destroy every trace of such rubbish, and prepare the land for the growth of the seeds of white clover, marl grass, poa annua, &c. which lie generally dormant in the ground, (the two former particularly,) for years; and the same good effect is found when applied to the hot gravelly loams, where its cooling properties counteract their tendency to burn, in the summer months.

LIME, CALX, CALCAREOUS EARTH.

In order to judge of the value of this earth as a manure, we must in the first place make ourselves acquainted with its constituent parts, and this is only to be done by such a portion of knowledge in chemistry as will enable us to analyze it; we must secondly, so treat it in its application to the soil as that no part of its effects be lost, but rather that the full effect may be obtained from it. In considering this subject, upon which so many contradictory opinions prevail, I will endeavour to shew the several practices of this county, which is one of the main objects of this work, and having done that, I shall point out the defects of those practices, and then submit some reflections which have arisen from the importance of the subject.

It will be recollected that in the former part of this work, under the article of chalk-stone, I have said that the great consumption for this manure is to be found in that tract of country which extends to the southward from Godstone, Reigate, Dorking, and Guildford, to the extent of the county, as well as into the adjoining parts of Sussex; and that the greatest demand appears to be for the Godstone chalk. I have already shewn in what manner it is burnt into lime, as well as the expence of burning it. We shall now consider its application.

To the southward and eastward of Tilburster-hill—Lime in its pure state, that is, unmixed with any other ingredient, is found not to answer generally, upon fallows, for turnips; but upon some soils, and in some seasons, its success is equal to every reasonable expectation. The reason of this difference plainly points out the necessity, for a certain degree of chemical knowledge, as the only means, by which the farmer may be able to discriminate for himself, and regulate his proceedings accordingly; this difference proceeds from this cause, the soil of the parish of Godstone to the southward of the hill before-mentioned, is a stiff, cold, deep loam, approximating in many places, to a clay; wherever a due proportion of lime is laid upon this soil, and properly ploughed in, it is found to separate it by insinuating itself between the particles of the soil; preventing it from becoming too dense and compact in the summer, and too wet and poachy in the winter, the water passing with great freedom through its pores; by this process, the roots or fibres of tially different, (it equally differs between the hills and the vales in the same parishes) the lime has fewer vegetable substances to convert into mucilage; the land is much poorer, containing more sand than the former, with which it readily unites, thereby preventing it from exerting its septic tendency so powerfully as it would do, and it retains its caustic powers much longer in all such soils, added to which, either the lime corrodes the turnips or corn, in consequence of this union with the sand, thereby preventing their growth, or the ferruginous particles in the soil are rendered more sharp and corrosive by the action of the lime; indeed potatoe sets have been so eat away, as to bring on the curl to such a degree, as to make the crop poor and miserable, and only fit for the hogs. If, therefore, it acts so with potatoes, what is to hinder it from doing the same with turnips. We find that in the parishes I have alluded to, it does; and for the reasons which I have assigned

As a manure for wheat it is in constant use, much more land being dressed with lime, than with yard dung. The lime is carried on the fallow, after the second ploughing, in the months of June and July, generally laid up in heaps of a waggon-load to a heap, and there left, exposed to all weathers for one or two months, and sometimes longer; if, in the interim, the land is ploughed, the distances between the heaps are never touched, so that while the rest of the field is undergoing a revolution in its system, these interstices are become neglected, and the weeds that would otherwise have been checked or destroyed, are vegetating and impoverishing the ground. After it is spread, the whole field, or such a part of it as may be limed, is harrowed well about, and then shallow ploughed, in which state it remains until seed time, when the field is landed-up and sown.

Let us examine a little the folly of this practice. We have remarked that the lime in its quick state and fresh from the kiln is carried into the field, shot into heaps, and thus left for several weeks exposed to all weathers; during the period that it remains there, the humidity of the atmosphere, the dews and exhalations enter into the pores of the stones that are on the outside of the heap, swell them, and slake so much of them, as there was moisture enough to act upon them; accordingly, those which are slaked crumble and fall to the ground, the lime immediately begins to absorb its air, and then becomes no longer quick lime, but effete lime; the rains that may fall slake the residue, washing all the finer particles, which is or effete lime, when applied to such soil, appears to me to arise from this circumstance only; that when ploughed in, and during its process of slaking, the heat which it generates by the absorption of moisture causes it to swell, and becoming supersaturated with air, it flies about in all directions which the tenacity of the soil cannot resist; it, therefore, becomes divided, at the same time that it imparts a portion of its caloric to it, producing an evident fermentation, and eventually making the soil mellow. If, therefore, instead of these several ploughings and stirrings, the lime is simply spread, harrowed, and then ploughed, the lime is turned down to the bottom of the furrow, where it remains; for when the seed is afterwards harrowed in, the tines of the harrows do not reach so deep as the bottom of the furrow, consequently the lime is not disturbed, nor does the soil receive any more separation than if it received no lime at *all.* Should much rain succeed immediately this ploughing in, and any considerable portion of silex either be in the lime or in the soil, it is almost a moral certainty, that such soil will be in a worse state than it was before the lime was put on; because, the moisture being retained by the lime and the soil, and the tenacity of the substratum not suffering the superabundance to pass quickly away, it causes the whole to run together, and form a compact and impervious bottom, which before might be pervious in a slow degree. That this must be the case, is evident from this consideration, that quick lime mixed with a certain portion of sand, and duly moistened, contracts and forms a substance which we call mortar or cement; in proportion, therefore, as the quality of these materials are more or less perfect, so does the substance become more or less compact, hard, solid, and impervious; such must be the condition of the soil, and it is but reasonable to suppose, that a great part of the seed sown upon it must perish. As it appears highly ridiculous to apply quick lime to such soils without pursuing a regular process from the beginning, and following that up by a succession of well arranged practices, so it must be just as absurd, to be at the expence of burning the chalk or lime stone, and then by exposing it to the air for so long a time, suffer it to spend and waste so much of its activity, as was thought in the first instance, to be absolutely necessary to correct the natural sluggishness of the soil, to separate its adhesiveness, and to attract most bigoted or incredulous of the impropriety of the proceeding. Again, another circumstance of no small importance in this mode of suffering quick lime *to* be spread some time on the ground before it is ploughed in, so as to lose its causticity, is, that it becomes so far disabled from killing weeds which in its active state it would do, that it rather tends very much to encourage their growth. We have said that quick lime provokes putrefaction, and it is proved thus: if a certain portion of quick lime is applied to dead but undecayed vegetables, it immediately shrivels them up, destroys their organization, dissipates their more volatile, and either combines with or lets loose their aqueous parts, its corrosive and dissolvent qualities will then reduce to a pulp or saponaceous substance the remains of the vegetable matter, converting them effectually into the food of plants; but if a greater portion of lime is added, it quickens the operation, and instead of inducing putrefaction, it absolutely prevents it. If a sufficient quantity of quick lime be added to a heap of dung in a state of fermentation, it will set it on fire, and the whole will be consumed, as I experienced in making a variety of experiments with manures at Yardley, and of which I shall speak more fully hereafter, where two separate heaps were entirely destroyed, the one being composed of quick lime, and fresh long dung, the other with the addition of a certain portion of fresh tanners bark.

The bishop of Llandaff, folio 251, vol. II, says, that calcined calcareous earth or quick lime, may be restored to the state of rude calcareous earth or limestone, by exposure to the air; in consequence

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of such an exposure, it, in a greater or less space of time, attracts from the air a part at least of the principle which it had lost during calcination; all pure calcareous substances are composed of nine parts in twenty of a volatile substance which is dispersed, not only during the calcination, but during the solution of the substances in an acid, and of eleven parts in twenty of an earth which is generally known under the name of lime.

To those who are advocates for the use of quick lime, it must be matter of no small importance to know, how to reduce the lime into a state of pulverization proper for dispersing it equally over the field, without impairing, but in as small a degree as possible, its active qualities.

The mode I have pursued for the last five or six years with great success, is to lay the lime in small heaps, of a bushel and half to two bushels each, and to cover them immediately with some fresh soil, made very fine; when the soil is laid as thick as you approve of, clap the whole close down with the back of the spade, so as to exclude the admission of either air or rain. In this state it may remain for a few days, care being taken during that time to keep every part of the heaps tight and sound, when it will be found that the moisture of the earth will completely have slaked it, it is then fit for use, should be immediately dispersed over the field, harrowed about in every direction directly, ploughed in shallow, and then stirred about with the nine-share plough diagonally, across, and up and down; as this instrument will do eight acres per day, and at a depth of fourteen inches if necessary, no implement of husbandry that I know of, is so fit for the purpose.

Another mode of slaking it is, as soon as it arrives from the kiln, throw a handful or two of the unslaked lime into a cask of water, with which the rest of the lime is to be slaked; this will dislodge the oxygen gas or fixable air from the water, and prevent that air from being again restored to the lime.

There are not wanting many sensible farmers in this county, who deny the use of quick lime, and argue in favour of lime being exposed to the air, in order to its being deprived of its causticity and becoming effete, and in this state they make use of it; it were to be wished for the sake of substantiating so material a point, that a variety of experiments were made upon different farms (of course there would be a variety of soils) at the same period, by well-informed men, these experiments should be conducted upon a good scale with different crops, and the several modes of liming pursued in the same fields, in alternate lands; *until something* like this is done, and satisfactory conclusions drawn from those experiments, we shall remain in as much darkness during the present century as we have been in during the last. The very learned Doctor Cullen says, that lime is antiseptic. Sir John Pringle maintains an opposite opinion. The publication on the subject of manures by Mr. Somerville, drawn up for the Board of Agriculture, recommends the use of quick lime in a long dissertation. The Rev. Mr. Brice Johnson, in his very able report of Dumfries, decries the use of it, and by very strong and powerful arguments, recommends it in an effete state, and he is supported in this opinion by Doctor Anderson, who says, if quick lime produces any effect at all as lime, as a saline substance, it must only be at the first, when it is applied; and it must act ever afterwards as powdered limestone. Doctor Abraham Wilkinson, on the contrary, says, that it appears to be of considerable consequence, that lime should be applied immediately from the kiln, if possible; as, from its attraction for fixed air when exposed to the atmosphere, it will return to a mild calcareous earth.

It is of so much consequence, therefore, that this point should be at rest, that I think it right to refer the reader to the generic or natural history of lime, (for which see *chalkstone*, Index,) and to offer the opposite opinions, as the only mode of bringing the subject to a fair issue, and that people may judge for themselves.

According to Lavoisier, Gren, and Kirwan, rude carbonat of lime, therefore, instead of dissipating the animal or vegetable matter which land contains, only reduces it more quickly to that state in which alone it can assist vegetation. A further distinction is, that it has not that tendency to combine, as it were, into a mortar with the sand of poor clays, which quick lime has, and lastly, carbonat of lime does not attract the carbonic acid from the soil; or if it should absorb a portion, it becomes more readily soluble in water, by being supersaturated with that acid, and therefore more readily applicable to those purposes in vegetation for which nature has adapted it. The distinction here laid down between the action of effete lime and of quick lime, is little more than an enumeration of facts.

If the mischief supposed to arise from quick limes strongly combining with the sand of poor clays be less positively ascertained, it is at least supported by the examination of such soils when they *have* been imprudently limed, and by the experience of farmers. It may, indeed, be alleged, that the pure action of caustic lime can never be exerted to any considerable degree, as it attracts fixed air too strongly, not to become almost immediately saturated by it. If any preference can be given to quick lime, it can only be where there is an abundance of vegetable matter, but on the contrary, it is no less apparent, that the carbonat of lime is preferable, where there is not more than a due proportion of vegetable matter in the land, and much more so, where land has been exhausted of it by injudicious cropping and a deficiency of manure. A very ingenious lime-burner has declared, that the dung dropt from the horses round his kiln is usually so completely destroyed by the lime which falls from the carts in filling, that, after several trials, he at length desisted from putting it on his land, as he found that it was absolutely useless. Lastly, as the carbonaceous principle is highly useful in promoting vegetation, the carbonat of lime is preferable to quick lime, in consequence of the carbon which its fixed air contains.

Notwithstanding this opinion in favour of effete lime, it is necessary to state, that a strong injunction must be observed in guarding it carefully from the too free access of moisture previous to its being laid upon land, or it will otherwise run into clods, and become incapable of mixing duly with the soil.

As the carriage of limestone is attended with a heavy expence, and as the stone loses about two-thirds of its weight, (depending upon the degree of moisture it contains previous to calcination,) by being thoroughly calcined; would it not be better to have it burnt on the spot, and for the farmers to buy it ready prepared?

With respect to the qualities of different limes, it is necessary to say something. Doctor Higgins has proved, from a variety of experiments, that the best lime is that which is made with the hardest and most compact stone, that will most quickly divide by immersion in water, and affords the greatest quantity of heat in this process, which causes it to fall into the finest powder; it should likewise dissolve in the acetous acid without effervescence, and leave the least possible quantity of residue. Commonly, the whitest lime is the best; but colour is not an infallible criterion of strength, because sometimes a dark coloured lime, as that at Dorking and Merstham, is stronger than that of Guildford, which is whiter; but it is always strong in the inverse ratio of its weight.

The lime in either of these states specifically the lightest, is in the same proportion the strongest. The only exception to this is, lime made from burnt chalk stones, or from lime stone, which has a very great proportion of chalk in it; this is the case with some of the Godstone lime, the Reigate, and the Carshalton limestone. When quick lime completely powdered is sifted through a fine hair cloth, that is the strongest, which leaves upon the cloth specifically the smallest of earthy or sandy particles; that is the strongest, of which the smallest quantity when spread on the same space of ground, in soils of equal quality, will ferment the soil, of that space, to such a degree, that it will not bear corn or grass for some years. The hot limes, which are analogous to strong limes, are *richer in* calcareous earth than the mild limes, which are synonimous with fat limes, like those at Stoke. The mild limes are more readily acted upon by the acid than the hot limes.

Whoever considers the effects of hot limes, will find, that they are the same as might be expected from the application of calcareous earth in its caustic state; and the following considerations have induced me to suspect that limes of that description retain their causticity longer than mild limes.

First, according to Doctor Ralph Fenwick, in any given quantity of burnt lime, it must be allowed, that, cæteris paribus, it will be more slowly saturated again with fixed air in proportion as it is richer in calcareous earth, for there will be a larger portion to saturate in proportion to the surface exposed to the air.

This will take place in a still greater degree where the lime is immediately mingled with the soil, for in that case the greater part of it can only drive the carbonic acid from the earth; and where a large quantity is required to saturate the whole, (as in hot limes which are richer in calcareous earth,) there is reason to suppose that no inconsiderable part will remain in a caustic state. It is also well worth remarking, that this will more readily happen in poor soils, as they contain a smaller share of elastic fluids than rich lands.

Second, it is found that mild limes combine more readily with acids than hot limes, which seems to arise from the force of aggregation being consitendency to combine with the aërial acid is sufficient to overbalance that circumstance. It is evident, therefore, that the greater or less tendency to combination must have a considerable effect.

From the frequent remarks made by every mason and bricklayer, that where mild limestone is burnt for the purpose of building, it must be very quickly mixed up, because it soon becomes unfit for mortar, or rather, it is found to have lost its cementing property. We are induced to believe, that what farmers call hot or strong limes, are such as reabsorb their fixed air more slowly, and therefore continue longer to exert the peculiar action of quick lime; and upon this principle, I think, we are to explain the following well authenticated fact:

If a heap of very mild lime, such as prevails at Stoke near Guildford, and about Carshalton or Oxted be allowed to lie for a length of time on land, a spring of white clover will arise when it is removed; but if a hot lime be left for the same time, no vegetation takes place for a considerable period, and the spot is at length covered with couch grass. Many of the less instructed farmers have supposed, that in these instances, the clover and couch grass are actually produced from the lime; the real cause of the appearance seems to be, that the hot lime retains its causticity much longer. In that state, it will destroy any seeds which the soil may contain; but the couch grass being less easily destroyed, or shooting and spreading from the neighbouring land, will soon take possession of the vacant spot: in the circumstance of clover following the mild lime there is nothing singular, as its seed is very generally diffused, and always vegetates in a calcareous soil.

As the opinion of lime being an exhauster of land appears to be well-founded, that effect is more to be dreaded than from its carbonat; for whereever it is applied, it will, in proportion to its quantity, dissipate the vegetable matter in the manner before-mentioned; it ought, therefore, to be carefully avoided wherever the soil is defective in nutritious matter. The carbonat of lime cannot, we apprehend, be productive of the same ill consequences: where it exhausts, (if the term exhausting can be applied to such an action,) it will only be by hastening the putrefaction of the animal and vegetable matter in the soil, and by that means applying a larger portion of them in a given time, than could be otherwise fitted to the growth of not impoverished by it. Should it be alleged, that in some of these manures, the lime-earth is combined with other substances which may counteract its exhausting powers, it must be admitted, that this is not the case with the others, especially with chalk, which forms the strongest argument in favour of this opinion. We are moreover informed of many instances of soils more permanently fertile than perhaps any others that are known, and which almost wholly consist of calcareous earth: of this Doctor Anderson gives a very remarkable instance. Should these proofs be thought insufficient, we may add the fact stated by Mr. Marshall on the Midland counties (minute 100.) In speaking of the Bredon lime he states, that the universal opinion of the county was, that if applied in a greater quantity than three loads per acre, it was always hurtful; he, however, applied five loads per acre, and with the best effect; but he tells us, that "after slaking it he turned it over carefully twice or thrice, at some weeks distance, thus affording it an opportunity to saturate itself with the aërial acid." In the neighbourhood of Grantham the farmers desisted from the use of lime, because they found their lands exhausted by it; the limestone was, in consequence, used to repair the roads, the scrapings of which were with great advantage applied to the same lands. We are, therefore, inclined to believe that the carbonat of lime is not naturally an exhauster of land, and that it is owing to mismanagement where it appears to be so.

Before we close this subject, it may not be amiss to offer some few reflections on the effects produced by calcareous substances as manures. We have already seen that they will be useful by promoting putrefaction, and we are perhaps authorized to add, that they will do this most powerfully, and with least waste, when saturated with the carbonic acid. In the next place, when the phosphoric or oxalic acids exist in soils, calcareous earths, by neutralizing them, will destroy a principle highly adverse to vegetation; and in strong clays, where the sulphuric acid prevails, they will not only destroy its action which it retains when mixed with clay, but also open the soil as well mechanically, as by the extrication of elastic fluids in the art of combination.

Of the benefit which the carbonat of lime is calculated to produce, by affording the carbonic acid, it may not be strictly correct to speak in this place, as the presence of this acid is not essential to calof remark, that calcareous earth is found in the ashes of all vegetables; that it is present in a larger proportion in wheat, clover, and some other plants, whose growth is more especially promoted by the use of calcareous manures; and finally, (if we may rely on the very respectable authority of Doctor Anderson,) that many plants, as peas, wheat, &c. will not ripen in soils in which there is no calcareous matter. We must therefore conclude, that calcareous earth is of the highest importance in the process of vegetation, and that an accurate investigation of its mode of action, by enabling us to judge with more certainty of the best manner of applying it, and of the circumstances which destroy, impede, or assist its virtues, would greatly contribute to the improvement of agriculture.

A kiln of lime of 450 Winchester bushels, is generally allowed to manure from three to three and a half acres, which is at the rate of from 100 to 150 bushels to the acre; this is the computation for the parishes of Godstone, Lingfield, Horne, Burstow, &c.

In the neighbourhood of Reigate and Dorking to the southward, they use from 60 to 80, and they extend it to 100 bushels upon extraordinary occasions.

Around Guildford, Godalming, and Whitley, nearly the same quantity; but about Cranley, Ewhurst, Ockley, Awfold, Okewood, Charlwood, &c. the land being stiff, cold, and poor, they find that from 100 to 180 bushels per acre, are not more than sufficient to produce any effect.

Note, if it becomes necessary at any time to plough in the lime immediately after it is spread and fresh slaked, take care to do it only when the soil is perfectly dry; and in leading the horses to the plough, take care also to prevent them from going through any wet places, so as to wet their hoofs or ancles, for lime acts not at all upon any dry substance; but when it is in its active caustic state, it would corrode the hair and flesh in a moment, if it has access to water.

As soon as the horses are unharnessed, keep their feet dry, till you have got them carefully brushed, so as to wipe away all the dry powdery lime that may adhere to them; and if the least shower should fall, unharness the horses immediately, and lead them out of the field. With these precautions there is no danger in working among caustic lime for any length of time.

But in case of any accident, by which a horse known that every variety of it possesses more or less of the sulphuric or vitriolic acid, and that all acids are more or less injurious to vegetation, so it becomes highly necessary for us to know, in what proportion this acid obtains in the gypsum, to the calcareous earth; as well as what proportion of it may be already in the ground.

These points being once clearly ascertained, and by observing with some attention the following regulations, we shall be at no loss about using or rejecting that sort of gypsum which we may be able to obtain.

First, when calcareous earth is by any process joined to an acid, be the sort what it may, they unite and compose what are called earthy salts; which take their name from the acid made use of. If equal proportions of acid and earth are added, this compound is said to be neutralized; but if, on the contrary, either prevail, which is almost always the case, the compound is then said to contain acid or earthy properties.

Secondly, whenever calcareous earth prevails in gypsum, its beneficial effects as a manure will be presently visible; because, the superabundant portion of earth, will be at liberty to act upon the roots of the vegetable, as well as to correct any small portion of acid in the soil.

Thirdly, whenever the two ingredients are exactly balanced, the compound is less able to separate the component parts of water in which it may be placed, or with which it may come in contact, while in the earth. Its effects, therefore, on vegetation can scarcely be perceived; nor is it likely that they should, since the parts of any substance that are not soluble in water, can produce no effects on vegetation, because they must in that case remain in their entire state.

If we look to the formation of gypsum, this theory will be found correct.

Gypsum, says that great chemist George Fordyce, is formed by exposure of calcareous earth to the air, from which it attracts vitriolic acid, and is also formed by the precipitation of magnesia, alumine, or metals from vitriolic acid by calcareous earth. It requires a very large proportion of water to dissolve it. It is with difficulty soluble in water, and remains dry in the air.

From thence we may with safety conclude, that unless upon chalk or limestone ground, whenever the acid prevails, no possible good can accrue by using it: on the other hand, whenever the calcareous earth predominates, we may rest satisfied that it will do an infinite deal of good, and especially if the soil has not already been saturated with chalk or lime. Kirwan says, the " Rationale of its " effects may be deduced from its extraordinary " septic power, for it is found to accelerate pu" trefaction in a higher degree than any other " substance; and hence it is not ploughed in like " other manures, but barely strewed on the surface " of the land, and in the month of February to " convert the old grass quickly into coal, to nourish " the young growth.

" As it is in itself no inconsiderable part of the " food of many plants, particularly of clover, pulse, " and corn, so the land upon which it is strewed " must be dry, such as would naturally suit clover, " &c. otherwise it would be useless. If laid upon

" dry heathy land, it would soon destroy every
" plant of that kind, and increase the carbonaceous
" principle, thereby fitting it immediately, as it
" were, for the growth of corn or grass."

It remains now to say something about the several species of gypsum.

First, the borat of lime, or Lunenberg gypsum is, according to Doctor Gren, dug at Lunenberg in Lower Saxony; it presents to our view cubic crystals, several or all of whose edges and corners are truncated. It is fusible in red heat. Of this gypsum, Doctor Alexander Crighton, of Clifford-street, among his most exquisite collection of minerals, possesses a very fine specimen. It contains magnesia, some argil, and silex, and the primitive form of its crystals is doubtless a cube, not a polyhedron, of 24 surfaces, as was by some imagined. When the corners and edges are truncated all around, it may receive 24 surfaces, which make it very beautiful. These crystals are so hard as to cut glass like a diamond, and strike fire plentifully with steel.

Klaproth, to whose indefatigable labours the science of natural philosophy, and particularly that part of it which relates to mineralogy, owes much; has thus detailed his experiments on the habitudes of this species of gypsum in the fire.

In the charcoal crucible, each crystal fell separately into a globular form; acquired a cavity in the middle, and presented, here and there incumbent, very tender ferruginous grains. Fracture, whitish grey, shining, uneven and foliated; in part also striated.

In the clay crucible, produced a yellowish, clean glass, containing some air bubbles, and having some small, separate, dim, white spots.

The specular gypsum, by the same analysis in the charcoal crucible, was rendered white, very friable, and its lamellæ specular or reflecting light, and its loss of weight 0.60.

In the clay crucible it rendered clove brown glass, with large spherical air bubbles.

Second, the common gypsum is thus described by Kirwan, it is composed of calcareous earth and vitriolic acid. It forms a distinct species of the calcareous genus of fossils, of which species there are six families, one of which is the sort usually employed. Its colours are grey, yellowish or reddish, or silvery white, or light red or brownish yellow, or striped with one or more of these dark colours. It is composed of striæ or fibres either straight or curved, parallel or converging to a com-

Gypsum has been found by Mr. Reginald Hooker, upon his farm at Brasted Court Lodge, near Sevenoaks in Kent; at least it so exactly resembles in colour, weight, and manner of acting upon vegetation as a manure that which he has been in the habit of buying, that he has no doubt of its being gypsum. As I am promised some of it, I shall endeavour to get it in time, to analyze it previous to the printing the whole of this report.

Mr. Wm. Saunders, of Westerham, says, he has no doubt there is the same earth at Westerham, if so, it will be of infinite service to him, as he is constantly in the habit of using it. Large pieces of gypsum, of upwards of 112 lb. weight are found in the pits of Fullers' Earth at Nutfield, in Surrey.*

Gypseous earth or stone is found at Chelaston, about four miles south of Derby, and at Beacon-hill, near Newark; there is a sort of it also found in great plenty and perfection at Shotover-hill, near Oxford, called the striated gypsum. The Derbyshire sort is sold upon the spot for five shillings a ton, of which about 800 tons are annually raised. I do not find, however, that any of them have been used as manure in or about those places; but it is from hence that the dealers in London receive it. The learned bishop of Llandaff speaks of them as being used only in the composition of different sorts of plaster. In the north it is called allplaster, being a corruption of the proper name alabaster, of which there are two kinds, the calcareous and the gypseous; and the way of ascertaining that difference is, to dip a feather in the acid of sea salt, that is the muriatic acid; touch the specimen of alabaster with the wet feather, and if an effervescence ensues, the alabaster is calcareous, it is of the nature of marble, and may be burned into lime; if no effervescence ensues, the alabaster is gypseous, it is of the nature of plaster of Paris, and very different from every sort of marble. All the strata of limestones, chalks, marbles, all gypsums, spars, alabasters, &c. are confessedly of animal origin; as on the other hand all argillaceous strata are supposed, probably enough, to have arisen from the decomposition of vegetables.

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* Professor Davey, of the Royal Institution, informs me that this is a true ponderous spar, and not gypsum.

The management of the fire in the calcination of gypsum is of great importance: too much heat decomposes it, and it becomes perfectly vitrified. On the other hand, too little does not enable it to year 1768. It has been applied with signal success in Germany, Switzerland, France, and America. If in England it has not been so much approved of, it must be because the calcareous principle prevails there almost universally. Clay lands, says Mr. Kirwan, are most improved by it. The time for spreading it is February or March, and he recommends it to be thinly strewed after the rate of eight bushels to the acre, as more than that quantity would be hurtful.

In the years 1792, 1793, 1794, Mr. Smith, of Tunstall, near Sittingbourne in Kent, made several experiments on the application of gypsum, as a manure for sainfoin, upon light loams, and poor calcareous soils, particularly chalky ones; and after repeated trials, conducted with great skill and attention, the results were highly in favour of this manure, as appears by the following abstract taken from the general account. The gross amount of the five experiments together is £32. 6*s*. 2*d*¼. and the average value per acre is £6. 9*s*. 3*d*. whereas, as the gross value of the three following experiments of natural product, including one made with soot, is £17. 1*s*. 1*d*¼. and the average value per acre £4. 5*s*. 3*d*. yielding a balance in favour of gypsum of £2. 4*s*. 0*d*. but between the gypsum and the soot, there was a fair balance of £2. 7*s*. 3*d*. in favour of the former per acre.

In the article of cow grass, there appears a clear profit, after allowing for the expence of gypsum, of £3. 0*s*. 8*d*. over the natural produce, upon the same quantity of land. Again, in the product of Dutch clover over that of the same quantity of land that was not manured with gypsum, the money price in seed and straw exceeded the latter by £10. 6*s*. 9*d*.¾ per acre; and would, in all probability, have been a great deal more, but one part of the gypsumed clover was sown among wheat, which was found to have injured it to such a degree that it did not yield so much per acre as the other clover by nearly one half; and the gypsum was not put on until the 22d of May, at the rate of six bushels per acre, and which before looked very pale and wanted sap.—That month was also much too late.

It was tried in the isle of Sheppy on some meadow and pasture land, of a stiff heavy clayey quality, but except making the grass look somewhat of a deeper green, it did not seem to have any other effect. So far Mr. Smith.

Mr. Wm. Saunders of Stonehall farm Oxted, and of Westerham in Kent, has favoured me with hay, which he finds to yield so abundantly as to exceed that which has not been gypsumed, (all other things being alike,) by nearly one load per acre. The second growth he generally feeds with sheep. He is of opinion that it forces vegetation more than any other manure with which he is acquainted; and he grounds his opinion upon the circumstance, that it wears out this plant in four or five years, instead of seven or eight, which it would otherwise have lasted. When he breaks up the ley that has been gypsumed, he always sows peas, which yield an immense crop.

When clover is thin upon the ground, he top dresses it with gypsum, at the rate of five bushels, and sometimes six bushels per acre, according as the plants may be more or less thin, and he finds that they stock out so much as to cover the ground very abundantly; and that he might be convinced of the value of gypsum as a top dressing for this plant, he left a certain portion of the land in the middle of a large field, where the soil was of equal quality, not gypsumed, and the result turned out to be nearly one load per acre in favour of gypsum. He has frequently observed the same difference in other fields, and therefore he does not fail to increase the practice. Upon this ley he sows wheat, and the produce is, in every point of view, superior to clover that may have been manured with any other dressing.

Wheat top dressed with it, will, if rain speedily follows, stock out surprisingly, and by the activeness of its stimulating powers it will bring it earlier ripe, of a finer quality, and greatly increase the produce. It is an enemy to worms and other terrestrious insects.

Mr. Kirwan recommends eight bushels to the acre as a proper quantity for top dressing, bu upon mentioning it to Mr. Saunders, he assured me that he had tried it in various quantities, viz. from five to eight bushels, upon the middling as well as upon the strongest soils upon his farm, and he found that three bushels succeeded well with all his crops, upon all soils but his very light ones; that five bushels were still more productive upon those soils, and that eight bushels uniformly injured the crop; he therefore confines himself within five bushels, but uses three, four, or five, a little more or less, according as he thinks either the land or the crop may stand in need of it.

Gypsum exists in greater quantity in various which is sold at Mr. Green's, the George Inn in the Borough, is entirely, I have no doubt, English produce; the greater part coming from Chelaston, and some, I understand, from Cornwall, but what part I have not been able to learn. Upon examining it, I found it to be much less pure and white than that which I saw at Passy, and therefore, I am inclined to think that our English gypsum, having more sulphuric acid than the French, and probably much less calcareous particles also, is neither so active nor so beneficial as theirs; it is, however, sufficiently so, as may be seen from the accounts of it which I have reported, to induce an extensive use of it.

As to that which occasionally comes from America, my enquiries at the custom house in London do not lead me to believe, that a sufficient quantity has been imported from thence at any time, to enable the dealers to vend it for the purpose of manure.

The price, either at the gypsum manufactory, or at the George Inn, is three shillings per bushel, ready ground and prepared for use. It is, in that state, about as coarse as rough meal.

I have no doubt that the refuse of most porcelain potteries would be of great service to all strong soils, because they often contain a great deal of gypsum, with which the moulds are composed. At the superb manufactory of porcelain at Sêve near Paris, I particularly observed the refuse to contain a considerable portion of gypsum, and I was somewhat astonished at being informed, that they considered this refuse of no use. The same circumstance I have often remarked at Flight's manufactory at Worcester, in which neighbourhood the soil is in general so strong as to require the assistance of every thing that will open it, the same may be said of the country round Woolverhampton, Derby, &c. where porcelain manufactories are established. I believe the late justly celebrated Mr. Wedgewood, at his seat at Etruria in Staffordshire, was the only person who ever used the refuse, and I have always understood with success.

MARL.

The marls of this county are of three kinds, the argillaceous, the calcareous, and the silicious: each of these has its respective varieties, in colour, in unctuousness, in tenacity, &c. From the number of large pits and larger ponds that are to be found in many parts of the county, particularly to the completely argillaceous; the nearer it lies to the hill, the colour is more of a bluish grey, or brown, and the farther from it, it inclines to a reddish brown, and in Horne parish, on the side of the road leading from Fellbridge across the common to Burstow particularly, of a yellowish colour, interlined with dark grey and white stripes; some of the pits and some of the edges of the ponds and ditches, exhibit marls abounding with a ferruginous matter, sometimes running in lamina as it were, through the marl nearly parallel, sometimes perpendicular, at others in spots like plum-pudding stones; while others prove strongly the presence of vitriol, by the acid which is imparted to the taste. The bluish and reddish marl appears fat and unctuous upon slightly wetting it, when it is so flixible and ductile, that it may be extended as it were like dough or paste to some length; exposed to the air, the moisture evaporates, and it falls in pieces nearly to a powder, in the same manner as lime does in slaking. Having dissolved some in water put into a glass, I found it to disunite very slowly, a ponderous matter subsided at the bottom, which was extremely rough, angular, and sharp, and had every appearance of being a hard gravel, and over that a greyish slime or glutinous matter, which I take to be the true marl. Having no other acid, except some sharp malic acid to try the experiment, I found it to effervesce very slowly: from these several appearances I was led to judge that the proportion of clay to that of the calcareous matter, could not be less than from 60 to 75 per cent. and that in this proportion, it became an admirable ingredient for the sands about Nutfield and Reigate, to which places it is brought at easy distances

The next sort of argillaceous marl is that which is possessed of the ferruginous particles before-mentioned. It is found abundant about the extremity of Lingfield and Godstone parishes, adjoining to East Grinstead, sometimes near the surface, but generally from five to twenty feet deep; there is also one vein of it running from east to west from Lingfield through Horne, across the common to Burstow, and is generally more or less of a yellow cast with streaks of dark grey and white; the yellow part of it is evidently the loam, the dark grey shews the presence of iron, and the white proves to be the aërated calx or chalk. In using this marl in its native state, it is found to be more or less injurious to vegetation, in the proportion which the combination with an inflammable substance, that metal immediately assumes its characteristic properties, and not only becomes soluble in acids, but becomes obedient to the magnet.

Therefore, when marl, in its native state, is examined by the muriatic acid, the iron contained in it will undergo no change, but will remain in the filter as part of the residue. On the other hand, if this marl is surrounded on all sides by burning pit coals, and is properly calcined, the iron becomes soluble in acids, and consequently fit to pass through the filter, with the calcareous earth invisibly suspended in the muriatic acid. Thus it is evident that in all marls containing iron the proportion of unsoluble parts must be diminished by calcination.

A strong proof of the existence of iron in the marl is its acquiring a reddish cast in the fire, which all clays containing iron are observed to do.

That the iron remains with the residue when the marl is analyzed in its native state, and passes off with the calcareous earth, when the analysis is performed, after the marl is calcined, is evident from a variety of circumstances.

For we find that the calcareous earth extracted from marl in its native state, is always white: the residue, by the action of fire, becomes red. On the other hand, the calcareous earth of calcined marl has a reddish appearance, the residue is white. Another process is to burn a small quantity of it in the fire with a little oil, beat the piece afterwards small, and apply the magnet, the iron will then adhere to it; or, boil a quantity of it in river or rain water for an hour or more, then strain and evaporate the fluid to dryness. If it contain iron, a powder will remain at bottom, which, if dissolved in water, will strike a deep black colour with an infusion of galls.

The third sort of argillaceous marl is the vitriolated, and is to be found also in Godstone parish, in Nutfield, in Horley, Charlwood, Ockley, and in some detached parts of the adjoining parishes. It is of a bluish colour, and now and then of a bluish iron-grey colour. It often shews itself in standing waters in ditches, in the summer months, when the fluid is almost evaporated, and in rills traversing pieces of waste land. Its presence is discoverable by observing a green scum of a different nature from that which proceeds from vegetables intermixed with blue. Upon examining this water after passing through a filter, the vitriolic acid is of clay. It is difficult to conceive how, without some such arrangement, the appearances that we daily find should be produced. Unless the clay cements the calcareous earth, water, which influences only the clay, would scarcely bring about the resolution of marl; nor would the calcination of this substance, which transports the property of relenting in water from the clay to the calcareous earth, produce the effects ascribed to it. Besides this, water, so far as is yet known, only destroys the attraction of those particles of clay to one another, not the attraction of those particles to any other substance; therefore, unless the particles of clay contained in any marl were in mutual contact, the application of water to that marl would have no effect; on the other hand, when marl of considerable purity is calcined, if the calcareous particles were in contact with one another, not even the increased cohesion of the clay would be able to prevent their separation, considering the quantity of calcareous earth contained in such marls, and the force with which that earth, after calcination, explodes in water.

But if we conceive the calcareous particles as separately involved in clay, which in its natural state readily falls down in water, and after burning, denies admittance to that fluid, all the phænomena are easily accounted for. Acids, however strong, cannot extract any calcareous earth from calcined marl, except such particles as lie upon the broken surface; and when these particles are thus carried away, the surrounding particles of clay, though more easily separated, still retain their former situation and attachments, which shows that such particles are fixed to one another, and can support themselves in their place without any assistance from the calcareous earth. But when water is applied to marl in its natural state, it gradually makes its way through the whole mass, which it reduces to powder. This, therefore, is a proof that the calcareous particles of marl have no mutual cohesion, since the whole mass moulders down as soon as the cohesion of the clay is destroyed.

And as no acid can find admittance deeper than the surface, to dissolve the calcareous earth in calcined marl, we may conclude, that taking out one particle of this earth, does not open a passage to another; and therefore, that these particles lie in separate cells. It may be here asked, how it happens, that acids can find admittance to the calcareous earth of marls, even in their natural state, applied in favour of the following supposition. It is probable, that in a compound consisting of calcareous earth and acid, the particles of the former surround and cement those of the latter. From this arrangement it is, that when such a composition is calcined, and put into water, the whole relents into powder, though only the calcareous earth is affected. In the same manner, when acids are applied to this calcined substance, they find no difficulty even without a previous pulverization, and without the assistance of effervescence, to reduce the whole to powder, because they dissolve the concrete.

The calcareous marl, as it is by much the most valuable, so if it were properly sought after, would prove equally abundant with the former. It is often found in the valleys formed between chalk hills, and at the base of those hills for some distance. The natural history of it, is perhaps accounted for in this way, that the sand and the manure with which the hills are dressed, being from time to time washed into the valleys, and as torrents of rain not only carry away repeated fragments of chalk, but the vegetables also, these meeting with some obstruction at the base, collect together at different periods, and form the combination which we call marl. Upon analyzing all calcareous marls, we find them possessing clay or loam, sand and chalk, and in proportion to the quantity of vegetables which have been deposited, so is this marl more or less unctuous or saponaceous. We often find it in regular layers, thereby indicating at once the manner of its formation. The marl in the neighbourhood of Dorking, Guildford, Leatherhead, Albury, &c. is almost invariably of an unconnected nature, sometimes it is moderately cohesive; at others, as in the neighbourhood of Reigate, Gatton, Merstham, Bletchingley, and Caterham, it is of a stony consistence, and thence denominated stone marl. In one instance, I found a body of silicious marl, with a regular bed of limestone under it, and a stratum of argillaceous marl under that. It is evident in this case, that the clay at the bottom, if it was not the native soil, at least must have been the soil which had formerly composed some part of the hill towards its base, which had been undermined, as we often find to be the case in chalky hills; the limestone being also loosened from the same cause that loosened the soil, it became washed down, and the finer part of the sand succeeded necessarily the limestone. This phenomenon I accidentally discovered in going that the only difference between them and limestone, consists in the proportion and quality of extraneous matter which may be contained in them. The greater the proportion of calx, the better will be the marl; and although argil and silex may necessarily compose the other proportion, yet we must be guided in our application of it by the quality of the soil to which it is applied; if the latter contains a greater quantity of retentive clay, our marl should have more calx and silex and less argil, and vice versa; in fact, good calcareous marl should, according to Kirwan, consist of 33 to 80 per cent. of mild calx, and from 66 to 20 per cent. of clay: it must effervesce with all acids. In powder it feels dry between the fingers; put in water, it quickly falls to pieces, and does not form a viscid mass. It chips and moulders by exposure to the air and moisture, sooner or later, according to its hardness, and the proportion of its ingredients, if heated it will not form a brick but rather lime.

Silicious or sandy marl is found in most of the loamy districts in the county, it is of a light grey, a lead colour, or of a brownish colour. It is seldom unctuous, does not adhere to the tongue, crumbles between the fingers, and feels gritty; from its combination with calx it does not readily fall to pieces in water, and by the same rule it connects, and sometimes cements into a hard consistence. As its name imports, it must be inferred, that there is an excess of sand over that of the clay; which indeed is the case, for upon analyzing it, we find a proportion of from 60 to 80 per cent. of sand; consequently its combinations are principally calx and silex. By exposure to the air and moisture it chips and moulders, but the operation is so slow as to prove the force or strength of the combination; with acids it does not effervesce so quickly as the calcareous marl.

From the preceding accounts of the different species and varieties of marls, it appears that the following conclusions arise from them: 1st, That dry clay suffers a very singular and material change by immersion in water, for its particles, then gradually receding from mutual contact, come at length entirely to lose their cohesive power, in consequence of which, the whole mass, after increasing in its volume, crumbles down into powder. 2dly, That clay, by the action of fire, not only acquires a considerable degree of hardness, but is at the same time so altered in its nature, that the

the calcareous particles, and denying admission to the water, supports the mass against the action of this fluid.

Limestone, on the contrary, and other substances consisting of calcareous earth, or calcareous earth and sand compacted into a solid mass, undergo no change from being exposed to the air; because none of their constituent parts have their cohesion diminished by the influence of moisture. But when these substances are calcined and thrown into water, as the calcareous particles then recede from mutual contact with a force which the cohesion of the particles of sand, if there is any, is not sufficient to resist, the whole composition must immediately fall into powder. Thus it appears that marls differ from other calcareous substances, only by containing a certain proportion of clay. On which account the class of calcareous bodies will admit of a division into such substances as in the air fall down into powder, and such as do not.

There are some species of clay which from their soapiness, and other qualities, are often mistaken for marls; and as some of these are possessed with particles which have proved extremely injurious to vegetation, it may not be amiss to say a few words respecting them. In some parts of the county, in the sandy district, and at some depth, a species of earth is found having all the resemblance of marl, but differing essentially in the requisite properties of it. This earth, upon being analyzed, appears to be impregnated with a mineral, and according to Woodward and Hill, is of the genus Pyritæ; as this earth contains not only certain mineral substances impregnated with sulphuric, and possibly with arsenic acid, and as I have no doubt but that this, as well as Selenite, which abounds in vitriolic acid, would be more often found, if marl was more frequently used, so it is an additional reason why farmers should make themselves acquainted with the substance they are about to use, either by making a small experiment of it upon their farm, or by having it analyzed by some medical man of competent skill. It is, however, clear that sea, river, or road sand will, if applied in sufficient quantity, correct a clay soil, as well as that clay will materially alter a sandy soil, and in both cases bring it nearer to the state of loam.

In applying marl as a manure, we find the following practice resorted to by the better sort of farmers: If the soil is a light, hungry sand, upon a bed of stone at some depth, the best argillaceous marl is to be procured, whether it be for pasture or arable land;

destroyed by the scythe, the lesser ones are unable to inhale sufficient gases to reanimate the plant; while the roots deprived of their usual nourishment, cease as it were to act, and the whole field becomes thereby a perfect caput mortuum. In this state, the marl is laid on according to the following table, regularly spread and repeatedly bush-harrowed; the marl, readily imbibing the dews and vapours, crumbles in pieces; the cooling and unctuous matter contained in it, softens the encrusted surface of the field, permitting the nitrous particles to filtrate, (if I may use the term,) through it, which the roots eagerly seize, giving new life to suspended vegetation, and producing a fresh growth without waiting for the benign influence of rain. This immediate benefit is, however, so small, that if it were the whole which the field was likely to receive, it could, under no circumstance whatever, answer for the expence; but fortunately for the farmer, the improvement and advantage is something like laying out money at compound interest, with this difference most certainly, that although the interest increases for a certain number of years, the principal is so far sunk, that unless he is the proprietor also, he must be satisfied with the interest only, which, if taken in time, will, however, amply remunerate him. In marling as in liming, Doctor Anderson's very sensible observations cannot fail to strike every judicious farmer; I shall, therefore, transcribe them, satisfied as I am that I cannot improve them. " I shall not," says the Doctor, " prescribe positive rules for determining when the one or the other of these substances, lime or marl, ought to be preferred as a manure, as a decision in favour of the one or the other must, in a great measure, depend upon the situation of the place where they can be both obtained, the purity of either of them respectively, the price at which they may be purchased, and the expence of carriage; all these circumstances may be best ascertained by every individual for himself.

" But I may be allowed to observe, that it argues a great want of knowledge of the real qualities of these substances, when a man prefers the one of these and condemns the other in all cases; for it is merely a matter of calculation, when the one or when the other may be most valuable to any particular person.

" If the marl be tolerably rich, and can be obtained at little expence near the field in the proportions usually employed, it will be in general more advantageous to the possessor, who has a prospect less quantity of calcined marl will be sufficient, in the proportion of a fifth or sixth, for it is found that calcination will improve and strengthen it very much."

Upon every deep tenacious soil, as well as upon thin ones, I would advise every farmer to examine the sides and bottoms of his ditches and ponds, he will often find appearances of marl, and in Buckinghamshire, I have, in that way, frequently discovered beds of the most valuable sort, which, perhaps, would have remained unnoticed for years yet to come; and which in a few years has greatly improved the farms upon which it was applied. Unfortunately in our heavy districts, there are few or no gentlemen interspersed among the farmers to excite by example that collision which rouses and brings into action the latent seeds of exertion and enterprise.

The price of good marl (when it is sold) is ten shillings per 100 cart loads, and is thus computed. Six shillings is paid for digging, and four shillings for groundage, and it is usually spread on the land for two shillings more; the price of the carriage is then to be added which must depend upon the distance and the roads.

The quantity applied per Acre is as follows.

		Cart Loads.	
On the clayey soils	for wheat,	from 150 to 180	calcareous marl if possible.
ditto	for pasture,	from 140 to 200	
On the sandy soils	for wheat,	from 120 to 150	argillaceous marl.
ditto	for pasture,	from 130 to 160	
On the loamy sands	for wheat,	from 100 to 130	calcareous or silicious marl.
ditto	for pasture,	from 120 to 140	

It is highly to be recommended, after having given the land a sufficient coat of marl at one dressing, to add a coat of good fermented dung about the third, fourth, or fifth year, according as it can be procured; it will supply the marl with mucilage, and cause it to act in a most beneficial manner. I need not add that the sooner it is applied the better, because, as all calcareous manures hasten the putrefaction of all putrescible substances, consequently, if there be not added at least a proportional quantity of dung, they must infallibly exhaust the land; for they convert all the putrescible matter therein to mucilage, much sooner than it would otherwise be converted.

BONES.

Bones are not much used in this county, either plied, and whether to be used as a top-dressing, are points which ought to be duly considered before any process takes place. When that is settled, the next point for consideration is, how to prepare these bones so as to preserve in the strongest degree the requisite qualities. Let us, therefore, endeavour to come at a crisis which shall possess the most powerful effects upon strong soils, as a preparation for wheat. I think Mr. Paget recommends the bones to be laid in a heap with lime, which in a short time reduces them to powder. I am not clear whether that may not be the best mode of preparing them, saving thereby the expence of grinding, and afterwards mixing them with lime. The mode I have adopted, and found to succeed very well, is as follows: I provided a layer of fresh or maiden earth of about eighteen inches deep at the bottom; to that I added a layer of bavins and faggots, and then a layer of bones, again a layer of bavins and another of bones alternately, until the kiln or heap was as high as I thought proper. On the outside of this kiln, I made a coat or wall of clay, tempered and mixed with chopt hay or oat straw, leaving a small opening at the top to give vent, until the kiln is regularly on fire; the slower it burns the better, and therefore large sticks mixed with the bavins are proper: the hole where the fire was laid is stopped up, and the hole at the top gradually lessened as soon as it is perceived or judged by the regularity of the fire, and the noise of the cracking of the bones, that every part is burning. The aperture must be reduced so as just to prevent its going out, always producing as much smother as possible in the kiln, to prevent its burning too fast. As soon as it is perceived that the fire is nearly exhausted, the hole is closed up, and in that state it is left to consume until the next day, when it is opened, and the bones, foundation, wall, and every part are carefully collected together, carried to a heap to be mixed with some more loam; in ten days, all this is turned carefully over, and well mixed together, and in about a fortnight more it is fit for use. For wheat, I have tried it upon strong, hungry, cold soil, like Enfield Chase, harrowed it before sowing, perhaps the same day; and the same with turnips upon a lighter land. Its effects were very considerable on the clay soil, producing an uncommon good crop; the oats that followed, and the beans which followed them felt the influence of the bones, and here ended this experinating animals, particularly large fat oxen, or sheep, properly prepared, continue to operate upon the soil after successive crops of grain or pulse; an experiment upon a small scale might easily be tried in alternate ridges, against the usual mode of manuring; the same crops on each ridge, would give in a given period the extent of the effect of bones; but individually considered, I am of opinion, that it is among the most lasting manures we have. No county that I know of uses them so much as Hertfordshire; and it would be an acquisition of a very desirable nature, if some of those eminent agriculturalists would take up the subject, and furnish the board with a variety of accurate experiments upon the qualities of bones of different animals, prepared in different ways, and applied to every sort of white crop, root crops, and pulse, in a variety of ways and at different seasons of the year, then only shall we know how to apply them to advantage.

The quantity applied per Acre is as follows.

Upon strong loamy soils for wheat....	5	cart loads	per acre,
Upon sandy loams for wheat........	4	..ditto	...ditto.
Upon strong loam for turnips........	4	..ditto	...ditto.
Upon sandy loams for turnips........	3	..ditto	...ditto.
Upon strong loams for barley........	4	..ditto	...ditto.
Upon light loams for barley........	3	..ditto	...ditto.

FURRIERS' CLIPPINGS.

A few of these clippings are used upon the light chalk and gravelly soils in this county, and sown at the last ploughing for wheat and barley; they should be harrowed in. They are bought about Long-lane, Bermondsey, and such parts of the

Borough of Southwark, at the price of 14s. to 16s. per quarter, which quantity usually runs as much as two five bushel sacks will hold when closely pressed. As some of the pieces are large, it is not unusual for those pieces to be harrowed up; and in that case, it is absolutely necessary that they should be immediately covered, to prevent dogs, crows, &c. from finding them out, which, when they do, great havock is frequently made among them, by the crows particularly. A field has been seen almost covered with them, and they are so eager at the sport, as scarcely to be deterred from their object by the gun. Twenty bushels is a very fair dressing per acre. They have been tried often upon strong soils; and in wet seasons it is thought they have done harm, because their peculiar property being to retain moisture, they would be improperly ap-soils, the oil that remains in the cloth, together with a capacity for retaining moisture, seem to fit them particularly for these soils. They are usually ploughed in, at the spring ploughing for wheat, and about November for barley. The price has been of late advanced as high as six shillings and six-pence per hundred weight. They in general require being cut in pieces, which is done by chopping them with a sharp tool, and which costs from six-pence to nine-pence per hundred weight. In a dry season they answer well enough on strong soils; but as the same season would fit them so much better for the light gravelly loams, and thin chalks, it is mostly for these that they are bought; large quantities being consumed in Hertfordshire, and but very few in this county.

The quantity applied per Acre is as follows.

Upon the chalky soils for wheat	10 hundred weight	per acre.	
Ditto......... barley	7......	ditto.....	ditto.
Upon thin gravelly soils for wheat	12......	ditto.....	ditto.
Ditto......... barley	9......	ditto.....	ditto.
Upon loamy soils for wheat	8......	ditto.....	ditto.
Ditto..... barley	6......	ditto.....	ditto.

HORN SHAVINGS

Have been sometimes used in the neighbourhood of Dorking, but in very few other places that I can learn, and these not in any great quantities, seemingly more for experiments than for any regular system of manurage. They are applied in the same manner as the rags, that is, ploughed in some time before the seed is sown; they cost in London seven shillings and six-pence a sack of eight bushels, closely pressed down; they are ap plied on all sorts of soils; and as they work well in most seasons, they would be a valuable article upon the stiffer soils, but I understand they cannot at all times be procured.

The quantity applied per Acre, is as follows.

Upon the loams for wheat	18 bushels per acre.
Ditto...... turnips	15..ditto..ditto.
Ditto...... barley	14..ditto..ditto.

FELLMONGERS' POAKE

Is every now and then used in the neighbourhood of tan yards; by some it is reckoned one of the most valuable and lasting manures, and by all it is considered good. It is applied as a preparation for wheat, turnips, beans, and potatoes. It is seldom used in its simple state, being rancid, and

Carshalton, Croydon, Lingfield, and Riegate, I am told, carried good crops for five years successively. It is calculated for all cold, stiff, heavy lands; and even upon the chalk and gravel, where the soil is rather tenacious, it is an excellent manure; opening, and separating its adhesive qualities. In the strong clays about Lovat and Horley it has been found very useful. I have seen it laid on a sour, cold, coarse meadow, in its simple state, and it succeeded very well; but a great deal of its virtues must be lost by evaporation; the coarser parts of the poake, after having lain three or four months on the field, and having been frequently moved about with a bush harrow, is then raked up clean and laid on the dung heap, by which process the heat of the sun extracts the alkaline juices, the winds dry up nearly the remainder, and what may be left must be so reduced, as to be of but little value; had it been made into a compost in the first instance, the whole virtues of the poake would have been preserved, and communicated to the dung, which would also have assisted in depriving it of its causticity, and thus rendered it of more value than it would be in any other way.

The quantity applied per Acre is as follows.

Upon lighter loam for	wheat	12	cubical loads	per acre.
Ditto	barley	10	ditto	ditto.
Ditto	turnips	10	ditto	ditto.
Upon strong loamy land for	wheat	14	ditto	ditto.

TANNERS' BARK

Is no where used that I can learn, most certainly not by farmers. Gentlemen even are found to let it lie in heaps, after it has come out of their hot-houses, without knowing what to do with it. Having, however, made some experiments myself with bark, it may not be amiss to particularize some of them here, as they may induce gentlemen and farmers who happen to be near tan yards to extend those experiments further. The tanners in country places are often at a loss what to do with it, and as it may be purchased for ten or twelve shillings per waggon load, and perhaps had, as is sometimes said, for nothing, it certainly merits some attention. My experiments were in the following order.

No. 1. To four waggon loads of fresh small tanners' bark, I added four waggon loads of fresh long horse dung, and let them lay for three weeks; the moisture in the bark kept the dung fermenting all the time.

No. 2. To four waggon loads of bark, as before, No. 4. The same quantity of bark and dung I covered over with twenty bushels of chalk; the bark and dung fermented strongly, and the chalk fell to pieces like powder.

No. 5. To the same quantity of bark, dung, and chalk, I added forty bushels of fresh maiden earth, and covered the chalk carefully; in this state it was left for three weeks.

No. 6. Tanners bark only, four waggon loads.

I set one man to each lot as soon as the sensible fermentation had ceased, and began to turn every one of them on the same day. I attended to it myself very closely, to see that every part was properly and thoroughly mixed; when that was done, I left them for three weeks longer, keeping a thick stick thrust into each, to ascertain the manner of its heating. When I found they had all abated considerably, which was in about a month, I had them turned over again on the same day, that the weather might produce no difference, and in that state I left them until they were nearly cold, or putrefaction had commenced, which took rather more than three weeks. At the expiration of the succeeding month I again turned them over as before, and so left them for use. I had a 36 acre field which had been very foul and starved, but which I well cleansed by five good ploughings, as many draggings, and harrowings, and it was in fine order for my purpose; I marked out the ground which lay shelving to the west, the soil a coarse stony loam, rather shallow upon a clay, with a lower stratum of chalk; the lower declivity of the lands was a much stronger soil, and was inclined to be wet; however, all the experiments were confined to the hilly part. I set out 18 lands of two rods wide each, and began with sowing half of each lot of manure, beginning at No. 1; these six lots I ploughed in directly, with a shallow furrow, and also the following three; viz. to the 7th land I gave a good sprinkling of soot; to the 8th a sprinkling of coal ashes, and to the 9th a coating of rotten dung; I then sowed white round turnip upon the fresh furrow, harrowed it, and rolled it the same day. The remaining nine lands were on the same day, ploughed and sowed without any amendment. As soon as the seeds vegetated, and the rough leaf was formed, I sowed the rest of the lots upon the plants, beginning with No. 1, next to the last land that was dunged, and ran a bush harrow over it all. As the lot two that was fired, and the lot six that contained the Tan that was used by itself without ing up, which I found but too true. As soon as their rough leaves proved it, I set the same man to hoe them again, I found that the turnips increased by it, and the charlock was greatly reduced; all went on as well as I could expect, but I could see that the top-dressing was behind in every lot: the 20th of May was the day the seed was sown. On the 20th of June, I had the plants set out afresh, and the ground well flat hoed; in a week more I procured two steady women, who looked over the plants, pulling up the extra ones, that every plant might stand single; they then stood at about 18 inches asunder, the women also pulled up all the charlock they could find, and the field was left perfectly clean. The season being rather dripping, the plants went on promising, we never saw the fly or the slug upon any part of the field; by the middle of July, the charlock was again my enemy. I had it again all pulled up, and it never more made its appearance. On the 1st of September, the following appeared from a very minute attention to be the order of their progress, lot 2, lot 3, lot 9, lot 4, lot 1, lot 5, lot 8, lot 7, lot 6; in the top dressing, lot 12, lot 18, lot 16, lot 17, lot 10, lot 13, lot 14, lot 15.

The latter end of the last and nearly the whole of this month was hot and dry; but finding that the plants preserved their colour, and were strong and healthy, I did not begin folding until the 1st of October; when another examination took place, and on that day, the state was changed to the following order, lot 3, lot 4, lot 1, lot 2, lot 5, lot 9, lot 7, lot 8, lot 6 were behind several of the top dressings, as follows; lot 10, lot 13, lot 14, lot 12, lot 11,

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then lot 6, of the ploughed in lot 9, lot 7, lot 8; the roots were proportionally large and fine, and I had at one time an intention to have run a line across the whole of them, and to have weighed them; but being unexpectedly called into Worcestershire, and having no convenience, I did not think it worth while to do it, as I must have depended upon my people; but as the ground was all hurdled off across, the difference was manifest enough throughout. As fast as the sheep eat off the turnips to the bottom, the ground was ploughed rather rough, and left for the winter to have an equal effect upon the whole; as my intention was to lay it all down with clover, that it might be got into good condition for a regular course of aration. All the rest of the land that was excluded from the experiment, was dressed with dung and earth from a mixen, with coal ashes, and the rest top dressed with soot, and

As the weather was dry with a steady wind at north and north-east, I resolved to cut it across. Having fixed stakes at each end, (and as there was what I called an alley of near three feet between each lot, I was in no fear of mixing the soils of each lot) the first week in March I dragged the whole, that is, with the ox harrows, and on the 15th of the same month, I shallow ploughed it into moderate sized lands, and sowed it with some fine barley, which I had procured out of Kent, at the rate of two bushels, and twelve pounds of very clean red clover to the acre, harrowed the barley in with the small harrows, and lightly rolled it with the barley roller, and thus left it. I proceeded in like manner with the rest of the field; the weather continued open, sometimes a little moist, but for the most part dry; exactly the season that suited us, for a glut of wet would have made all the land run together. Having secured my water furrows, I was now in no sort of apprehension about weather: the seed vegetated kindly, and I found a surprising crop of charlock gaining ground; as the seed was all sown broadcast, I had no opportunity of hoeing, and being determined that at least my experimental crop should not be injured, I had it three times weeded by hand. On the 1st day of May, the lots were in the order I have arranged them below; in this state of progression they continued, and ripened much in the same order; the straw was proportionably stronger, and taller, the ears were larger, and the sample finer. The crop from the first to the last was in the following proportion.

Turnips.

Manures ploughed in.	*On the first of September order of growth.*	*On the first of October.*
No.	Lot	
1 Bark and dung.	2 Bark, dung, and lime.	3 Bark,dung,lime & earth
2 Bark, dung, and lime.	3 Bark,dung,lime & earth.	4 Bark, dung, and chalk.
3 Bark,dung,lime & earth	9 Spit dung.	1 Bark and dung.
4 Bark, dung, and chalk.	4 Bark, dung, and chalk.	2 Bark, dung, and lime.
5 Bark,dung,chalk & earth	1 Bark and dung.	5 Bark,dung,chalk & earth
6 Bark only.	5 Bark,dung,chalk&earth	9 Spit dung.
7 Soot.	8 Cinder ashes.	7 Soot.
8 Cinder ashes.	7 Soot.	8 Cinder ashes.
9 Spit dung.	6 Bark only	10 Bark and dung.
		13 Bark, dung, and chalk.
Manures top dressed.		14 Bark,dung,chalk &earth
No.		12 Bark,dung,lime & earth.
10 Bark and dung.	11 Bark, dung, and lime.	11 Bark, dung, and lime.
11 Bark, dung, and lime.	18 Spit dung.	18 Spit dung.
12 Bark,dung,lime & earth	16 Soot.	16 Soot.
13 Bark, dung, and chalk.	17 Cinder ashes.	17 Cinder ashes.
14 Bark,dung,chalk& earth	10 Bark and dung.	6 Bark.
15 Bark only.	12 Bark, dung, and earth.	15 Bark.
16 Soot.	13 Bark, dung, and chalk.	
17 Cinder ashes.	14 Bark,dung,chalk&earth	

clover, which, in fact, was the case all over the field; it stood the winter well, and the lime and chalk soon began to act upon it. In March the farm was let, and having no further concern with it, nor opportunity of viewing it after that season, I was not able from my own observation to see the results; but I learnt from the tenant, who came to consult me on some points relative to the lease, that some parts of the field continued for several succeeding crops to be very productive, which, from his description I supposed to be the lots three, four, and five. I continued to see the clover three, or four times afterwards in that year; the lime and the chalk had made it the most rank, and it vegetated the quickest of any in the neighbourhood.

Upon all strong soils, tanners' bark, after its period of fermentation is over, mixed with chalk only, will, I have no doubt, make a good manure for pasture, and upon thin, gravelly, and sandy soils, I should apprehend it would be equally suitable if applied in a rotten state, that is, after it has done its office in the hot-house; because, I am of opinion it would tend to keep such soil cool, though I know of no virtue that it could impart to vegetation. Upon grass land, my father and I have tried it upon a large scale for several successive years, but we never found any benefit from it when applied unmixed.

As I cannot either from my own experience, or from any information which I have endeavoured to collect, ascertain any proportion of tanners' bark, which can be established from real experience, to be proper to be laid on any land; we must endeavour to supply the want of such knowledge, by having some criterion of its quality and capacity to guide us. If the intention is to open a stiff soil, it ought to be laid over the land at least three inches deep, which should be well harrowed in before it is ploughed; and when it is ploughed, an addition of two horses should be made to the team, and a strong heavy harrow with long tines, fastened to the plough, in order to pulverize the soil while it is moist, and without over treading it; it will also mix together better. When the whole field is finished ploughing, it should be directly ploughed across, and may be then left for its regular course of treatment. If the land is light upon a gravel, and the design is to keep it cool, I apprehend, that two inches deep of rotten tan will be sufficient; for more than that, and even that quantity, may, per-that bark ploughed in produced only 21 quarts to the bushel, and used as a top dressing, only 16 quarts, which is just one half of what it did produce in a state of compost ploughed in.

I am very far from thinking this experiment can be considered conclusive, because it was tried upon a soil which is not generally met with. It ought to be tried in a variety of ways and seasons, and with different sorts of grain. The account is however sufficiently complete to prevent the loss of so much bark as is always to be seen in large heaps in the tan yards in the country, for want of knowing how to use it; and it will, I hope, be the means of inducing intelligent men in the neighbourhood of those yards to carry on the experiments for the advantage of the science.

At Edenbridge, in Kent, which is divided from the parish of Lingfield, in Surrey, only by a small stream, I saw a farmer trying an experiment on some grass land with a composition of tanners' bark in its fresh and crude state, and a proportion of caustic or quick lime; the moisture from the tan operating upon the lime, had set fire to the heap, but as these heaps were of considerable length, very narrow, (viz. about a yard at their base) and tapering to a point like the ridge of a house, and not exceeding three feet high, the fire was kept under and from burning by heaping fresh bark upon it, so as to induce the lime to spend itself by smothering; the exudation from which (if I may use the term) was strong and offensive, and emitted a prodigious deal of smoke. I could not learn the proportions of the two ingredients which composed these several heaps, as they appeared to be made by no given rule; but it would be a very easy matter to ascertain the due proportion, since all that is required is to destroy the extreme crudity of the tan. I should apprehend that one bushel of caustic lime would be sufficient for three bushels of bark; and from 80 to 100 bushels of this mixen, would be ample for an acre of grass land.

FELLMONGERS' CUTTINGS AND TROTTERS.

In the present improved system of husbandry, and in consequence of the great value which every part of the produce of the farm has of late years acquired, we find the spirited farmer making every attempt to vary his crops, and to increase the natural powers of the soil by the introduction of some extraneous animal or vegetable substance, with recommended to him, not by the professional man, but by the person to whom he has casually applied, and who persuades him to try something which he has an interest in getting rid of, and in this way I find that fellmongers' cuttings have been sometimes brought into use. Upon deep loamy soils, and upon dry strong soils that are not wet, they are ploughed in during the fallow previous to the landing-up, for wheat, and in the same way for barley. If the season proves favourable, and the corn covers the ground well, the operation of this manure is very considerable; it not only produces a full clean grain, with a bright strong straw, but the bulk of the crop is greatly increased. To account for its operation in so favourable a manner, it is only necessary to mention the substances of which it is composed. In the first place, there are the clippings of the skins, to which, after they have passed through the lime and the bark, and are become saturated therewith, a great deal of effete lime remains attached; then there are the trotters, with which there is also a great deal of sand mixed, the reason of which I am not able to learn; for although I have attended the process of tanning and dressing these skins in the country tan yards, for the purposes of this survey, I have not found that the introduction of the sand was necessary in any part of the process, and therefore I have reason to think that it is peculiar to the fellmongers of the Borough of Southwark. When these clippings and trotters are harrowed in, it is necessary that they should be frequently looked over, to cover those which may be left on the surface, for the putridinous effluvia which they soon emit, attract dogs, crows and other vermin to them, who scratch and pick them out of the ground, making a great havock among them. It is no unusual thing to see a field almost covered with these devouring creatures.

The price varies very much at different yards; at some they are sold for four-pence per bushel heaped loose, at others as high as nine-pence.

The quantity applied per Acre is as follows.

Upon deep loams for wheat	36	bushels to the acre.	
Ditto .... barley	38	.. ditto	.. ditto.
Upon strong soils for wheat	40	.. ditto	.. ditto.
Ditto .... barley	38	.. ditto	.. ditto.

BOILED HOPS, SOUR GRAINS, AND REFUSE OF BREWERIES.

Very large quantities of these articles are collected from the large porter and pale beer breweries adjoining the road that leads from Brixton Causeway to Camberwell, upon wheat, turnips, cabbages, and beans, assured me, that he found an essential difference in his crops, when he made use of one sort of dung, and when he was obliged to use another in the mixen. When I saw them, which was as often as my other engagements would permit me, they corresponded with his account of them. The detail is as follows:

The mixen with cow dung upon wheat, if sown early, so as to cover the ground well, and in a hot dry summer, produced an extraordinary crop of fine wheat. For turnips, cabbages, and beans, it was so productive of weeds, that he was obliged to give the first an additional hoeing, and the others, two and sometimes three; the crops were very good. In a moist or middling season, the horse dung had in every instance the preference, both as to productiveness and cleanliness; and he was of opinion that the compounded mixen was much better in the latter season, than the cow dung. He has tried these ingredients without being mixed with dung, but he did not find any sensible advantage from them; and this he could not account for, although he was satisfied, that with the addition of dung his crops were greatly improved. I shall endeavour to assign what appears to me to be conclusive upon each of these points. The mixen with the cow dung only, although it had never fermented, having the wheat sown early, enabled the plants to out-grow the weeds; or if the weeds got the better of the wheat at first, the spring hoeing enabled the latter to gain the ascendancy; and having once covered the ground completely, the natural coolness of the cow dung operated to the advantage of the wheat in a dry season. In the second instance, the mixen with the horse dung having regularly fermented and passed to the state of putrefaction, it became a great forcer, and therefore in a moist season, the salts were set at work and operated so much more perfectly to the advantage of the crop. In the third instance the compound mixen had in this moist season, much of the advantages that the latter had, but was somewhat checked or abated by the cow dung, which was not effectually counteracted by the addition of hog dung, because I apprehend it was not in sufficient proportion. In the latter instance, the hops and grain, having passed through the state of fermentation, their saccharine and vinous particles being extracted ginous putrefaction begins, the whole is then equally possessed with the carbonic acid, which we have before proved to be the food of plants.

The land upon which these experiments were tried is a strong loam upon a clayey gravelly bottom, very apt to crack in the summer, and if left any time without being ploughed, after the crop is off, requiring five, and sometimes six horses to break it up; but then they always plough deep, from 10 to 14 inches.

As all their crops are drawn off the land, they generally manure for almost every one, and as these farming gardeners never spare the dung heap, the following table will be accounted for.

The quantity applied per Acre is as follows.

Upon strong lands for	wheat	20	cubical loads	to the acre.
Ditto	turnips	18	ditto	ditto.
Ditto	barley	16	ditto	ditto.
Ditto	beans	20	ditto	ditto.
Upon lighter loams, for	wheat	16	ditto	ditto.
Ditto	turnips	16	ditto	ditto.
Ditto	barley	12	ditto	ditto.
Ditto	rye	20	ditto	ditto.
Ditto	tares	12	ditto	ditto.

Note, having never heard of this manure being laid on grass, mixed in any way, I have not ventured to set down any quantity; but I should conjecture that 12 to 14 loads would be sufficient for an acre of any sort of pasture.

SUGAR SCUM.

The scum, or skimmings of sugar during the process of refining, is the substance we are now about to treat upon, and has been used with various success by several gentlemen in different parts of the county. In the neighbourhood of Guildford, Mr. Sumner, and Mr. Currie have each of them tried it, and highly approve of it as a very rich manure. In the operation of refining the raw or clayed sugar, it is dissolved in boiling water; that is, a certain portion of stone caustic lime is thrown into the water, which soon makes it boil; the first solution is clarified with stone lime, and bullock's blood, and after due inspissation, it is poured into moulds, from whence the fluid part is drained off by an aperture at the bottom. This operation is repeated according as the sugar is required to be more or less refined. As there is a great deal of saccharine matter which rises to the surface, and of sediment that settles at the bottom of the pan, which last is the soil that is brought up with the cane not well cleaned, the former is repeatedly skimmed, and the latter is carefully removed when the liquor is poured off; the collected dross of all which composes the manure above-mentioned.

This being the case, we can no longer doubt of the effects of sugar in itself as a manure, but when united to substances of which we have had sufficient experience, our conviction of the advantage of sugar scum is at once complete and satisfactory. To light soils it is not thought to be well adapted, as tending to increase that heat which a large body of sand is known to produce; but to those clayey soils which abound with acids it is particularly adapted, and will, by uniting with them, render them so far neutral, as not to be injurious to vegetation. The relative proportions of its combinations are as follows: To every 100 parts of raw sugar, bullock's blood is added in the proportion of 25 per cent. and the strongest stone lime water about $\frac{1}{17}$ parts, and from every 112 lb. of sugar, nearly 12 lb. of a sandy consistence and vegetable mucus is deposited during the process; the blood retains its elastic state, and does not appear to be at all injured or lessened in its quality by the process. It is of a very caustic nature, yet swine will leave every other sort of food to gorge upon it, and it very speedily produces diseases of a scorbutic nature. Crows, carrion birds, and dogs, seek it with great avidity.

Upon meadows and pastures, on cold retentive clays, spread thin and with great regularity, its effects are presently visible and permanent; but if laid in lumps, and not properly diffused, it leaves the soil perfectly bare. It is evident, therefore, that on all burning soils it would be improper to use it. Upon arable lands it is thought not to answer.

Wm. Coles, Esq. of Norbury Farm, in this county, has used it in large quantities for these three or four years. He finds so much difficulty in getting his people to spread it regularly in its raw state, so that all the land may be equally enriched by it, that he now mixes it with road sand, and after having been regularly turned over and mixed, he uses from 20 to 30 cart loads, according to the state of the ground per acre, and immediately bush harrows. He has given it some fair trials, and where it has been properly done, land that appears to me not to have yielded of late years half a load of hay to the acre, promises to produce this year near if not quite, two loads. Lord Gwydir, Sir Stephen Lushington, and Mr. Byng, the very patriotic member for Middlesex, have used it for several years, and agree in its extraordinary fertilizing powers on cold grass land.

To mix the scum properly, I think three or four ternal ditches full of stagnant water in the winter, choked up with decayed and decaying weeds, and leaves of the hedges, and trees, the sides of the ditches trodden in, and in fact the whole in such a state as to prevent the waters from draining off the land. If we attentively examine the sediment which may be left, after the waters are either drained of, or are dried up by the heat of the season, we shall presently discover, that the contents are for the most part very materially different from that which is found in ponds, whether they contain springs, or whether they are perfectly stagnant. This will appear by comparing the two descriptions, which, with very few exceptions, will be found the prevailing characters of both; and, therefore, I felt disposed to consider them separately.

The contents of every ditch must depend, first, on the nature of the soil, and secondly on its inclination, (if I may so call it,) to encourage the growth of aquatics, and the major and minor weeds, shrubs, and trees, on its banks. If these are suffered to grow unmolested, rude, and wild, the continued decay of them, together with the repeated treading in of the upper soil of the minor bank by the cattle, in their endeavours to reach and browse on the shoots, their dung and urine dropt during their shelter in those ditches, or during their feeding, collect together a body of matter which, in process of time, becomes a combination of putrefactive substances, which, properly treated, may be turned to the most valuable account. But what is the usual process. It very seldom happens that the entire ditches, internal as well as external, belonging to a farm, are cleaned out more than twice, perhaps not once, during a lease of 21 years. When they are cleaned, the hedges are first cut down; the two sides of the bank are pared, the loose stuff falls to the bottom of the ditch, and that, together with all that may before compose the sediment, or vegetable matter in the ditch, are thrown against the bank as high as the former top of it, in order to face the bank, instead of throwing out all that was there collected, of whatever nature it may be, and in the form of a ridge in the field, parallel with the ditch, and taking up a fresh bottom soil to repair such banks. From this statement of the fact, we cannot but be sensible that a large body of very valuable manure is inevitably lost, and what is worse, the whole contents are, of all materials, the most unfit to add to the face or surface of a bank, being most liable to be washed down by rains, to be shaken by the operation of ditches affords a manure, that requires no other preparation than to turn it over two or three times, and mixing and breaking the clods very fine to make it fit for use.

Notwithstanding, however, it has no absolute occasion for any extemporaneous assistance, it is on some occasions infinitely improved by the addition of quick lime and dung, not only as making the whole go much further in dressing a particular spot of land, than the same quantity of either of the ingredients would do, but the intrinsic quality of the whole would be so much the more augmented thereby. Upon the whole then, I cannot too strongly recommend this article to the serious attention of the cautious but intelligent agriculturist, because, he would find in it a resource that will admirably suit his soil, and be the means of lengthening out his usual and ordinary supply of manure; at the same time that he may be draining his land of a superabundance of water, a matter of the utmost consequence to him.

Upon strong land a greater proportion of lime may be added to the compost than upon the lighter soils, and in the latter perhaps, an increase of yard-dung would be equally advisable, but the whole must necessarily depend upon the quality of the ditch scourings.

Used as a Compost.

Upon strong loams for	wheat	20	cubical cart loads	to the acre.
Ditto	turnips	16	ditto	ditto
Ditto	barley	16	ditto	ditto
Ditto	beans	18	ditto	ditto
Ditto	pasture	12	ditto	ditto

Upon light loams	wheat	16	cubical cart loads	to the acre.
Ditto	turnips	12	ditto	ditto
Ditto	barley	12	ditto	ditto
Ditto	pease	12	ditto	ditto
Ditto	old pasture	10	ditto	ditto
Ditto	lay to break up	14	ditto	ditto

MUD FROM PONDS.

Great attention has of late years been paid to this valuable part of rural economy so far as relates to collecting it together. Its properties however seem not at all to be understood; for we find some farmers carting it on the land immediately from the pond, and ploughing it in for turnips: and others, for wheat: others we see carting it on the lay, or on old pastures from the pond; others cart it to some waste, spread it out very thin in heaps to dry, before they attempt to mix it either with lime, chalk, or dung; others, on the contrary, mix it immediately, and which ought to succeed such application? One general observation occurs with respect to dissertations on all sorts of manures, and that is, that as there will be different gradations of soils and substances composing these sediments, and of soils to which they are applied, we can never speak but in general terms, particularizing, however, as nearly as we are able, the constituent parts of them.

Ponds being situate generally at the lower part of fields, receive, during and after every hard shower of rain, if the soil is argillaceous, a portion of the dung, with which it may have been manured. Ponds, however, which are situate upon these soils, especially where they are accompanied with stones of a sandy nature, too frequently possess a portion of vitriolic or ferruginous matter, which they shew by the scum upon the surface of that part which may be more immediately acted upon by the iron or the vitriol; in which case it will appear evident, that unless the mud out of such ponds be mixed with quick lime, the vitriolic or ferruginous matter will get so diffused through the soil as to endanger its being spoilt; or rather, that the crops of grain or grass will be sensibly affected by it. If the pond is large and in places deep, it may possibly acquire much decayed vegetable matter, especially in the winter, constantly brought by the wind, and by the dying of those aquatic plants that usually abound in ponds. The sediment in such a pond cannot be greatly benefited by the dung of cattle; it can at best but be partially so, because, they are not likely to venture over every part of it, consequently their droppings, be they what they may, will only affect a small portion of it. Should the pond be full of springs, or composed of running water, any mud that may be taken from it will be very unfit for vegetation; for upon exposing it to the air, it will be found to harden and concrete in the sun, and to add but little either to the staple of the soil, or to the supply of food to the roots of the plants; as it will be found to contain more sand than in ponds of stagnant water, such mud, nevertheless, may be extremely useful for low, coarse, sour, rushy, meadows, which it will, to a certain extent, correct, by killing the rushes and encouraging the better sort of grasses.

I have seen this sort of mud used upon upland pastures that were apt to burn in the summer, without any sort of advantage arising to the field. And it will readily appear that this must be the case, if we consider that the silicious parts of such mud, shall tend to counteract the defects, and to improve the preponderating imbecility of the soil.

From a due consideration of all the circumstances of pond mud, I am very far from thinking it, generally speaking, of equal value with mud out of ditches, that has been accumulating for an equal period; and I am fully persuaded that no mud should be laid on any land until it has laid exposed, and been repeatedly turned over for the space of twelve months, or has undergone the same operation in conjunction with lime, chalk, marl, or dung, according to the design before-mentioned. The usual time of mudding ponds is in July and August, or during any of the summer and autumn months. If the mud is viscous, and not sufficiently dry, it is usual to let it lie near the edge of the pond until the water is drained from it; a place is then marked out as near to the field upon which it is to be used as possible, and of a size that will contain all the mud, dung, and other ingredients that are intended to compose the mixen. A foundation is laid of mud about 14 or 16 inches thick, upon which the freshest yard dung is brought and thrown over about three feet thick, next a thin layer of pond mud, sometimes a layer of quick lime or chalk succeeds that, (if the latter, it is broken small) then a layer of mud, afterwards dung, and so on with alternate layers until the heap is at least 7 or 8 feet high, then the last covering must be a thin one of mud. If the heap ferments properly, and sinks gradually and regularly, it will be ready to be turned over with three-prong forks in six or eight weeks, when it is to be well shaken up and mixed; and as it will again ferment, it will increase the value of the heap by giving it another turning. At the first making the heap, a wall of mud should be made from 14 to 18 inches thick all round it; this wall may be turned over by a handy workman, and that part, which before made the outside of the heap, may be turned to the inside, and at the last turning may be all mixed with the heap into one mass; this mixen will be well enough adapted for wheat, if it can be got properly ready in time, or for barley or for turnips, and it is often laid upon pasture lands of different qualities. If the heap is likely to lie a long time until putrefaction has completely taken possession of it, or in other words, until it is quite rotten, it is then usual for the farmers to give some of their servants leave to plant the top with potatoes, in order to keep it clean; but every such practice is bad, because every sort of manure should be used before it arrives at that state.

the farmers of Surrey and Kent, a fund of manure, which, when properly applied, is of a very valuable nature.

This manure is composed of the sweepings of the streets, which are made up of sand or fine gravel, called hoggins, in which the pavements of the streets are bedded; the droppings and urine of about 30,000 horses and cows, the rubbish from sugar bakers, the blood and filth from slaughter houses, the refuse of oranges, lemons, &c. from the fruit merchants, and the rectifiers; the sweepings of vegetables from the markets, the waste from the dye-houses, tallow-chandlers, soap-boilers, and other manufactories, and a variety of other matter which is collected daily from the houses of the inhabitants of those places: all which form a combination, which can only be collected in such places, and which is chiefly deposited by scavengers at certain depots in St. George's Fields.

This vast body being laid in heaps, the moisture soon evaporates, and there remains a solid mass of black vegetable and animal matter behind. During its stay in these depositories, it undergoes no purification by fermentation, or by exposure to the air from turning, but remains in that state till it is sold.

The farming-gardeners, the cow-keepers, and those gentlemen who amuse themselves with farming, are the principal consumers of this manure. By the first and second body of men, it is made into composts, with horse or cow dung; seldom or ever being used alone, and is applied to the land for field or garden cabbages and savoys, for turnips, for rye, winter tares, wheat, barley, &c. By the latter, it is also formed into composts, with dung, leaves of trees, the refuse of the kitchen garden, and sometimes with the addition of chalk, or road scrapings, and it is used for their pasture grounds, their kitchen gardens, and on their farms for wheat, barley, and turnips. The physic gardeners also, who live about Mitcham, Croydon, and Beddington, buy sometimes large quantities, and after having mixed it, they dress their old quarters preparatory to their being planted, with spear, and peppermint, pennyroyal, angelica, wormwood, liquorice, marygold, poppies, hysop, clary, lavender, elecampane, horehound, feverfew, and a variety of other medicinal plants.

By each of these descriptions of persons, with whatever other substances it may be mixed, it undergoes one or more turnings, to incorporate and [redacted] plainly perceive that a great deal of azot, or hydrogen, oxygen, and carbon is combined in the sweep ings; we know that hydrogen forms a constituent part of every animal and vegetable substance; we know also, that in the process towards acidity, which all putrescent substances arrive at, oxygen comprises a part of the composition, as well as that carbon makes up a large proportion of the residue of vegetable substances. Now, according to the Abbé Fontana, Hassenfraz, Ingenhouzs, Senebier, and others, these ingredients compose the food of plants. The quantity, therefore, of food, which such a vast variety of ingredients must necessarily yield, will be found to be much more considerable than is to be met with in most other bodies of manure that we know of; in addition to which, it has the advantage of being free from the seeds of weeds. Viewing it, therefore, in the light which it appears to me to warrant, perhaps no manure is so calculated for all sorts of soils. If it is applied upon the strong and cold soil, the sand, the bones, and the lime, will open and stimulate it. If it is of a hot burning nature, the rags, the lime, the cow dung, &c. will retain the moisture and keep it cool, while the dung, the urine, the fat, &c. after having undergone a regular decomposition, will supply the carbonaceous principle in its greatest extent and purity.

The price of this valuable manure in St. George's Fields is three shillings per cart load, or as much as three horses can draw: if carried by water to the banks of the Thames, it is sold from 4*s*. 6*d*. to 5*s*. 6*d*. per cart load, according to the distance at which it is delivered.

The quantity applied per Acre is as follows.

		Cubical loads.	
Upon strong loams	for wheat	10	to the acre.
Ditto	cabbages & savoys	12	ditto.
Ditto	turnips	10	ditto.
Ditto	tares & rye	8	ditto.
Ditto	medicinal annuals	8	ditto.
Ditto	medicinal perennials	10	ditto.
Ditto	medicinal shrubs	14	ditto.
Ditto	pasture	10	ditto.
Upon light chalky loams	for wheat	9	ditto.
Ditto	turnips	9	ditto.
Ditto	barley	8	ditto.
Ditto	tares & rye	7	ditto.
Ditto	pasture	8	ditto.
Upon gravelly loams	for wheat	10	ditto.
Ditto	turnips	10	ditto.
Ditto	barley	8	ditto.
Ditto	tares & rye	8	ditto.
Ditto	medicinal annuals	8	ditto.

judiciously executed, forms a coat that resists damps, and shews no change by the alteration of the weather.

It is very much used by gentlemen for the foundation, and often for the walks themselves in gardens, where it makes a dry and firm road, at all seasons, except the breaking up of a frost; some considerable quantity of it is even in this part of the world mixed with dung, and other composts, and applied to grass land, but it is found not so useful upon the soil in the neighbourhood of London, because it is generally too shallow, and near the gravel, and consequently always liable to burn; but the farther you go from the metropolis, in general, the better the quality of the scrapings, and the more the land is fitted to receive them. I will further explain this substance; from Kennington turnpike to Brixton Causeway, the gravel that is laid on the road is a sharp sand stone, the soil in the same neighbourhood is a shallow loam, upon a bed of the same gravel; beyond that to Croydon, the gravel is silicious or flinty, at a greater depth, and the soil increasing from a light loam to a very stiff loam, and from a bright red through the gradations of hazle to a dark brown; in this soil the scrapings cannot fail of being of great use, either applied to grass or arable land; beyond this to Tilburster, the gravel is flint, abounding on the surface, the soil various loams, upon a bed of chalk, or limestone; among these flints a great many loose limestones are found, when these and the flints are reduced to almost a powder, they become particularly valuable for the heavy lands about Warlingham, and Godstone.

The scrapings of the road from Tilburster to East Grinstead are produced from a stone of the genus Pyrites, which, according to Hill and Woodward, is composed of metallic substances, mineralized by sulphur or arsenic, or by both, and of an unmetallic earth intimately united with its other principles. It has much of the character of selenitæ, such as its not fermenting in acids, and readily calcining in the fire, not being inflammable or soluble in water, being composed of slender filaments, and ranged into flakes; but as the latter does not contain any metallic substance, and is not ponderous like the former, I am disposed to think it belongs to the class I have ascribed it to. This stone is found in great abundance on Tilburster Hill, within the manor of Godstone, belonging to Sir William Clayton, Bart. and although the country on both sides of the high road, for eight cemented, and none that I ever saw that wears so little, considering the heavy weights of chalk, &c. that are continually traversing the road; another circumstance strongly indicative of its character, and which tended to strengthen my suspicions, was, that it is found to bed itself in a sandy road, and to cement and unite its parts in the same firm and solid mass as it is known to do upon the loams and clay.

But, as it is a great object for every farmer who either uses these scrapings now, or may hereafter make use of them, not to be led away by suspicions of any injurious tendency, especially if he thinks he has found benefit from the application, it becomes necessary that he should know something of their properties: I have, therefore, taken uncommon pains to analyze the stone, and by a variety of experiments, conducted with as much accuracy as I have been able, endeavoured to ascertain those properties, which I beg leave to detail in the order of *trial*.

Having provided myself with several stones of different sizes, taken indiscriminately from a large heap, I took two of them and reduced them to a powder; this powder I did not sift, but weighed 2 dwts. 16 grs. of it, which I put into a wine glass. Upon this I poured as much spirit of nitre as covered it, so as to saturate the whole; it was then closely covered up and put by.

To the same quantity of powder put into a second glass, I added as much muriatic acid as covered it, and having covered the top of the glass as before, it was put by. To the same quantity of powder put into a third glass, I added as much common but strong malic vinegar or acid, covered it up and put it by. As the glasses were kept close by me, and constantly in full view, I frequently examined them without uncovering them, but could never discover the least effervescence: in this state they remained for one week. I examined each of them every day, in the same order they were prepared, and found not the smallest alteration in any part of them. I then broke a piece of stone as nearly as I could, to weigh four ounces; I put it into a clear coal fire, and calcined it to a red heat; upon taking it out, I weighed it, and found to my astonishment that it was neither increased nor diminished in weight by the calcination. I broke it asunder, and while red hot I poured upon one piece some spirits of nitre, it made a small hissing noise, and greedily absorbed the liquid, it produced no change in the mass so as to fall to powder: but that part of covered each glass, so as to exclude the admission of atmospheric gases, I put them by.

I took another piece of stone not calcined, and having separated the calx as well as I could from the stone, I reduced each of them to a fine powder. I procured some soil from a neighbouring field, under a course of fallow, taken indiscriminately, and having reduced that to powder also, I weighed one ounce of the mould, to which I put one pennyweight, or the twentieth part in weight, of the powdered calx, and mixed them intimately together; having so done, I put some rain water to it, and made it into a perfect paste by kneading it. I then took the same quantity of stone reduced to a powder, mixed it with one ounce of the mould as before, kneaded it together, and placed both lumps in the sun to dry. The next day I examined them, and found each lump had formed so hard a cement, that it was difficult to decide which was the most so, but if there was any difference, it was in the calx, for I could perceive, in the act of drying, that it took up the water with which it was kneaded faster than the stone did; or else the heat of the sun acting upon the iron, caused a quicker exhalation or evaporation of the moisture, and occasioned the constituent parts of the combination to enter into more immediate contact with each other; and this same cause might give the increased power in the cement, for it was evidently become not so large as the other.

Having proceeded so far, I took some more of the same stones which I calcined, separated the calx from the stone, weighed out the same quantity of calx and stone and mould as in the last experiment, and treated it exactly in the same way, and on the same day the result was, the calx increased its cohesion with the mould, and was by much a harder substance than either the stone or the two preceding substances. The operation of calcining the stone, or the effects of the acids upon it after calcination, seemed to increase its power of cohesion also; for upon rubbing it between the fingers, and examining it with a microscope, the angles of the stone appeared sharper and rougher, and might on that account occasion the greater adhesion of the cement.

Being thus satisfied, and having, I think, proved that my former suspicions were well-founded, I then proceeded to ascertain the effects of this stone upon vegetation.

And primo, I reduced a large quantity of it to a powder; I weighed one pound of it, and put it into

As the seeds were all fresh and good, and having placed the pots in my window on the outside exposed to the south west, they soon vegetated, and appeared to shew no marks of primogeniture; they grew healthy and strong with the exception of the first, which were always languid and weak; when the roots had got to the bottom of the pot, I perceived that the second were declining, which induced me to take up two of the plants carefully; I found the roots were spotting with black, and one partially eat through with the calx, as I imagined. The third kept growing without intermission, and I examined the roots of two of them and found them perfect. The fourth were not quite so vigorous as the third, but much more so than the second, and upon examining the roots of two of them, there were some small knobs or protuberances, and below these swellings very small red spots like canker. The first grew spindling, but got weaker, and I found that to keep them vegetating, they required to be watered twice a day, and in double quantities each time. I examined the roots of the plants and found them very weak, considerably corroded, and in my opinion were kept in a state of vegetation by the water and the air alone; in little more than four weeks they were dead. The second now began to make slow progress, and the leaves to turn yellow; I took up the worst plant, and found some of the roots eaten through in several places evidently with the canker, and the tap root turning upwards. The fourth were following the example of the second, but not in so marked and hasty a manner; and upon examining the roots of the worst of one of them, the excrescences before noticed were enlarged, and the size of the spots increased. The worst plant in the third pot I took up, and found that the roots were sound, but being completely matted and the other plants perfectly healthy, I was led to consider that they required more moisture to keep them vegetating, having hitherto given each pot an equal quantity of water every day: I, therefore, doubled the quantity, which increased the vigour of those in the third pot, and I soon saw that it hastened the dissolution of those in the other two pots; the mould when dry became more dense and hard, the stems as well as leaves grew more yellow and feeble, particularly in the second pot, and finding that there was no chance of recovery from the enfeebled state of the plants, I turned them out of the second pot, shook all the mould carefully away from the roots, and found them black from the point upwards from one half to two thirds of the height; these I cut off, and planted one of the plants carefully in a pot of fresh good mould, but could not recover it; another I planted in a pot of the same mould, but with all the roots good or bad, this soon died; the plants in the fourth pot continued stationary for some time, and then went off, which I found to proceed from the canker and the hardness of the soil. The plants in the third pot had acquired a considerable height and strength, and were running to seed; the roots had got through the hole at the bottom of the pot, appeared fresh, and having kept them ten days after the plants in the fourth pot were dead, I turned them out and examined their roots very minutely; among which I found here and there a small speck or canker, which I suppose to have arisen from my not having been able to separate every particle of the calx of iron from the stone, or from some vitriolic property in the stone, which it is more than likely it possessed.

The result of these experiments sufficiently prove the contents of these road scrapings; and although the parts of these minerals may be so small, and when mixed in a compost may be so much further detached from each other; yet, as the generality of the soil by the side of this road, abounds more or less with the same mineral, every addition to that must necessarily tend to do harm. Independent of the bad effects occasioned by the quantity of mineral acid in the stone, we find also, that even the pure stone pulverized, tends to cement loamy and clayey soils together; it is in that point of view, therefore, exceedingly improper for all the arable lands of that neighbourhood, which want to be opened rather than to be compressed. The only possible way in which I could advise any person to use it, would be to mix it with lime or chalk, which would separate the iron from the stone, and it might be laid on coarse, sour, pastures, the sharpness of the stone would separate and divide the parts of the grass, and as lime and chalk are known to be improvers of the herbage on all grass land, it might thus united have the effect of correcting all such pastures. After all, I should be sorry from what I have said to be the means of inducing any farmer to forego the use of those scrapings, if he is satisfied that he has found benefit from them, notwithstanding I may be convinced that the advantage must be derived from some other adventitious causes, rather than from the Tilburster stone.

In other parts of the county where the roads are either sandy or chalky, the scrapings of them will be of singular advantage to the stronger soils, for independent of the repeated droppings, together with the urine with which all turnpike roads more or less abound, they possess a large portion either of calcareous or silicious earth, particularly on this side of the Sussex oak on the Crawley road, and, therefore, become in themselves, or combined with certain vegetable matters, highly advantageous for all heavy lands.

Whenever road scrapings are made into a compost, it is absolutely necessary to consider what is the quality of those scrapings, and next what may be the constituent parts of the soil to which those scrapings are to be applied; then say, that as that soil and those scrapings are more or less strong or

The quantity applied per Acre is as follows.

Upon strong loams for	wheat	30	cubical loads	per acre.
Ditto	turnips	25	ditto	ditto.
Ditto	barley	20	ditto	ditto.
Ditto	beans	25	ditto	ditto.
Ditto	pasture	20	ditto	ditto.
Upon light loams for	wheat	20	ditto	ditto.
Ditto	turnips	16	ditto	ditto.
Ditto	barley	14	ditto	ditto.
Ditto	pasture	12	ditto	ditto.
Upon chalky loams for	wheat	20	ditto	ditto.
Ditto	turnips	16	ditto	ditto.
Ditto	barley	16	ditto	ditto.
Ditto	pasture	12	ditto	ditto.

Note. In the course of this last summer, I took occasion to analyze some fresh pieces of Tilburster gravel, in consequence of the repeated arguments I had held upon the subject. I made choice of two stones, the one a perfect calx, or as nearly so as I could find, the other was free from calx of iron; I reduced these to as fine a powder as I could in the mortar, and on the 28th of June, I sowed six pots filled with mould from a fallow field intended for turnips, and in which none of these scrapings had ever been used, and I put from 2oz. to 8oz. of those powders in different quantities, thoroughly mixed with the mould by sifting them together; I sowed also one pot, filled the lower half with the same mould, and the upper part with the pulverized calx, and another with the same quantity of mould at bottom, and the same quantity of the powdered stone at the top, as there was of the calx. Into each of these pots, six fine plump seeds of white round turnip were planted at equal distances, and the pots were placed together in an airy but sheltered situation; the seeds in the first six pots were all up by the 3d of July, but it was not until the 6th that any appeared in the two latter. On Tuesday the 17th all the latter had perished, though regularly watered. I emptied these pots, put the same quantity of the same mould, and the same quantity of the same powdered calx and stone separate into them, and sowed six fresh seeds in each; the same results succeeded this trial as in the preceding, and nearly as near the same time; all the plants perished at the root; having more of the same stones I pulverized them, but left the particles more gross, and put the same quantity as before to the same quantity of mould as in the former cases, in which I sowed six fresh seeds, they vegetated well, but were all perished in six weeks, those in the stone uniformly before those in the branes, and those nearly bare. I then put some of the same sort of mould into each pot in order to land up the plants, and in that state I shewed them to several respectable farmers, who were much astonished at their appearance; I still confined the animals to the old plants until most of the membranes were eaten, never omitting their proper quantity of water, and then I destroyed them; at that time there was not a remnant of a leaf left on some of the plants. I therefore carefully watered them all over every evening, put some into the shade, and the rest remained as before. Those in the shade first threw out leaves anew, which was afterwards done by all the rest, and at this time, December, they look just as well, and the roots are nearly as large as those whose leaves were but a little injured. The size of the bulbs, however, are very small, while those which were some weeks after sown in the field are large and fine; from thence I am led to conclude, that these scrapings are injurious to vegetation, because, I have found the same results from peas, kidney beans, and potatoe oats. I know it may be said, that plants not growing in the calx or pure stone proves nothing, because the same will happen to native chalk and marl; but I submit, that as far as my observations go, the farmers are indebted for the seeming benefits they derive from the scrapings to the dung and urinous particles that are continually being deposited on the road, which cannot sink into it, but are washed to the sides by every hard shower, accounting for the fineness of the grass there found; the scrapings also contain every species of decayed vegetable matter as well on the road as on the side, and these combined and laid on the land, may produce an appearance of fertility, while at the same time the land may be receiving an enemy of the most forcible kind, in the nature of calx and this stone. At any rate, I think it is proved, that if it does not destroy vegetation altogether, it greatly retards it, which is a matter of no ordinary consequence.

RUBBISH FROM BUILDINGS.

Every farmer knows that the species of manure I am now going to treat upon, is the mortar, the plaster, the decayed wood, brick, and other matter which is found about every brick and stone building that is pulled down; even a wooden building, if it has been occupied as a dwelling has more or less plaster about it, and as such, is generally purchased by the more experienced farmer to lay on his land.

Every atom that can be collected is almost exclusively made use of for agricultural purposes, and as the county of Surrey has kept pace with its sister county of Middlesex, in its improvements in buildings, we find almost all the ancient houses making way for those of a more modern style; consequently, the use of the substance now under consideration has been so prevalent as to give most of the attentive farmers abundant opportunities of seeing it applied, of remarking its effects, of considering its properties, and of trying it themselves when so inclined.

In all very old buildings where brick and stone have been worked up together, and especially if the latter have not been squared, we find a prodigious quantity of mortar used, to fill up the cavities occasioned by the irregularity of the stones; the long continued influence of the air, sun, and rain, which the building has received, has impregnated the mortar, if not the bricks, with a large portion of nitrous and carbonic acid; the more the building may have been surrounded with lofty trees, or if it be in a town with houses, the stronger will every part of such a building be impregnated with alkaline salts; because, whenever the air is too heavy to admit the ascension of the volatile parts of smoke, soot, effluvia from animals, and, indeed, every thing putrefactive, they fall down, and lodging principally against buildings, form an increasing coat of extreme fine particles, and the residue is either inhaled by the trees and plants, or is deposited in the earth; even the inside walls of the houses are affected by smoke and other bituminous particles from fires, and by the breath, perspiration, &c. of the inhabitants of them; consequently they cannot fail of being more or less impregnated therewith. Now we know that chalk in its native state, although it be no manure, yet it improves most soils to which it is applied, for the reasons I have given under the article chalk and lime. If, therefore, chalk is an improver of soils, what must not be the case with mortar and plaster, after being thus impregnated? From a variety of experiments which I have tried myself, and seen tried, it appears that the rubbish of buildings such as I have described, will go farther upon most soils load for load, than the best rotten horse dung that can be procured, how much farther it will go than either chalk or marl we shall presently see;—27 bushels being the proper, and ought to be the standard cart load, to every acre of pasture ground it is usual to put on 20 loads of horse dung, or 25 to 30 loads of chalk, or according to the quality, 25 to 30 loads of marl as a proper dressing; from what I have ascertained of this rubbish, from 15 to 20 loads is quite sufficient, not only to give an equal degree of fertility to the soil, but to cause a quick vegetation, considerably improved in its quality; which undoubtedly gives it a preference to dung, for though the latter also increases the fertility of the soil, yet at the same time, so far from improving the herbage it is apt to make it more rank and coarse, and to bring with it a long train of weeds. It may not be so permanent a manure as marl and good chalk, but is equally so with lime and more so than dung; I am, therefore, warranted with the sort of rubbish I have stated, and which sufficiently satisfied me of the excellency of this manure; the detail of these experiments will more fully prove what I now advance, and will be found under the article of Wheat.

Even walls composed of the worst sort of clay, chalk, or sour hungry mould mixed with straw, with which many cottages are built, after having been erected a number of years, become strongly enriched with nitrous matter, and have been known to produce extraordinary crops; when, if those articles had never been employed in building, but used as manure after having been mixed, and perhaps laid in a heap as dung usually is, they would have produced little or no good at all.

By analysis, the plaster and mortar from old walls of inhabited places is found to contain nitrat of lime, or calcareous nitre in great abundance; as may be proved by the simple addition of potash, only made into a lye, and common nitre will be produced; which circumstance alone is therefore sufficient to account for the extraordinary degree of fertility which is observed to attend the application of this manure.

As I have said before, I tried it last year as a top-dressing for wheat against soot and coal ashes; but it was not equal to the former, although it was evidently superior to the latter, and the reason I could assign for the difference was, that the season proved very dry after these manures were sown; although at the time, there was just enough rain to set the soot at work, yet there was not enough for either of the other two; and when the rain did fall during the month of June, and the first part of July, that which had been sooted had gone on so regularly, gaining strength as it proceeded, and had got so much the start, that the other parcels could never overtake it; though it was much inferior to that which had been sown at the same time with the wheat.

After duly considering the properties of plaster and mortar, I should be much disposed to apply them as manure upon strong loams, and from the result of the experiments which I have alluded to, when it is used for arable land, it should be shallow ploughed-in with the seed. It will, no doubt, greatly assist all silicious soils; but its nature seems peculiarly adapted to the stronger soils. Upon any sort of coarse rushy pastures, it will, I am confident, be of infinite service, and tend to make them fine and sweet.

and worn out ones, such as we often find about Lingfield, Burstow, Horne, Charlwood, Tandridge, Chelsham, Waldingham, Addington, Byfleet, Chobham, Bishley, &c. and where, from the scarcity of extraneous manures, this plant may be converted into such, and become highly useful to us.

To my Lord Dundonald I am indebted for the hint, and if by the propagation of his lordship's sentiments I can be an humble instrument in making two ears of corn, or two blades of grass to grow upon a spot of ground where only one grew before, according to Dean Swift, I shall deserve better of mankind, and do more essential service to my country, than the whole race of politicians put together.

As there are some other plants which I propose to submit in the same way, I shall begin with the plant above-described in the very language of his lordship.

It is no uncommon practice to sow buckwheat, tares, and other green crops, for the sole purpose of ploughing them in: thus providing the ground with a proportion of fresh vegetable matter at times when other manure cannot be procured, and also promoting the dissolution of the inert or sluggish matter contained in the soil by the stagnation of air, and by the retention of humidity, occasioned by the close cover and shade these crops afford.

Judicious as this process in many cases may be, of encouraging the growth of certain vegetables, with a view of promoting, by their subsequent destruction, the future growth of others, yet the beneficial effects of this system of cultivation, by due attention to the vegetables which certain soils have a tendency to produce, is to be extended much further than most farmers are aware of. To attempt making such soils produce, without chemical acids, other vegetables more serviceable to men and cattle, would be premature, as it would be an endeavour to force nature to productions for which she is not yet prepared.

Soils not calcareous, containing much inert vegetable matter, or peat, have a tendency to produce mild sorrel, a plant considered in general as an indication of the want of fertility in the soil. This is certainly correct, if the fertility of the soil is only to be estimated by the use or value at market of the crop, but not as it respects vegetation itself; for a soil of the above description often produces a most plentiful crop of sorrel. In this case as it applies to the further improvement of the soil, the growth of sorrel should as much as possible be enby the application of different substances, viz. by lime, by chalk, by magnesia, by alkaline salts, and by paring and burning.

Lime will combine with the acid of the sorrel, and form an oxalat of lime, which is insoluble: as such it should only be applied in such small quantities as will neutralize the acid in the soil, or the superabundant proportion of acid contained in the sorrel; so that the other component part of sorrel, viz. the oxalat of potash, may not be decomposed by the superior affinity which the oxalic acid has to lime; in which case the alkali would be disengaged. No injury will arise from the application of a superabundance of lime, provided that the soil contain a still greater proportion of vegetable matter; in which case the alkali, disengaged by the lime, would act upon the vegetable matter, and form a saline substance similar to that which the superabundant use of lime had decomposed.

Ground of this description, to which lime has been applied, will no longer have a tendency to promote the growth of sorrel in preference to other plants; its next spontaneous growth will probably be chickweed and groundsel, which is a certain indication of its being in a state fit to produce grain, or other crops.

Magnesia has a greater affinity with the oxalic acid than alkalis have, so that by the addition of earths, containing magnesia, to ground producing a crop of sorrel, the acid will not only be neutralized, but the oxalat of potash, the other component part of sorrel, will likewise be decomposed. By this means the alkali will be disengaged, and put into a situation to act upon and dissolve the inert vegetable matter contained in the soil. The salt formed by combination of the magnesian earth with the oxalic acid, will, as well as the vegetable matter dissolved by the alkali, be found to promote vegetation in a very great degree; hence magnesia, by forming with the oxalic acid a soluble salt, has an advantage over lime, which forms with the same acid a salt that is nearly insoluble, but capable of being brought into action by methods previously stated.

By the application of alkaline salts to sorrel, there results a salt fully neutralized, which highly promotes the vegetation or growth of more valuable plants and grain.

When neither magnesia nor alkaline salts are to be procured, and where it is not proper to make use of lime, the thinly paring and burning the sward, consisting of the plants of sorrel and their roots, may be performed with advantage; as a large proportion of alkaline salts will be procured for the purpose of dissolving a correspondent proportion of the inert vegetable matter contained in the soil. The operation of paring and burning is only recommended as a last resource, and in performing it great care should be taken that as little of the surface mould as possible be consumed.

The application of the different substances here recommended, or the operation of paring and burning, should take place only at the time when the crop of sorrel is in the greatest luxuriance.

In considering this subject with all the attention I am master of, it appears to me that our great object should be to produce a sufficient crop of this vegetable: for this purpose the seed ought to be sown; but as I never knew of the seed of this sort of sorrel to be sold, I should advise the garden or French sorrel to be sowed instead, which is a more luxuriant growing plant in every respect, equally hardy, and consequently more full of vegetable matter. The seed may be purchased generally at about 2*s.* 6*d.* per pound: 12lb. I should consider enough for an acre, sowed in the spring about April, broad cast in the same manner as red clover, after two or three winter ploughings, harrowings, and rollings. When the plant is in full blossom, let it be mowed down, and as fast as it is mowed it should be sown with quick lime, giving it a good coat, and ploughing it in immediately with a shallow furrow, but completely turned over; the moisture from the sorrel will instantly act upon the lime, which will in its process discharge the acid of the sorrel, and produce a considerable fermentation in the ground. But it is to be understood that it cannot be ploughed in too soon before the sap is at all dried up; if it is ploughed in standing, unless the furrow is very wide, a great part of the plant will not be turned completely under. Now, every man must be aware from what I have before observed, that in order to produce fermentation, there must be a sufficient body of fermentable matter lodged in the earth to effect it; if therefore part of the vegetable is not turned under furrow, but left out, that part cannot ferment at all, but becomes dried up, and rendered of great disservice, by retaining its acid principle which the lime has not been able to correct. And this points out to us also the necessity for mowing the crop before it is ploughed, in order that the lime may be sown regularly, so that every part of the ground may be equally covered with it, which it is impossible can be the case while the crop is standing; for as our object in sowing the lime is to discharge the acid of the sorrel, so wherever that is not done the intention becomes completely frustrated.

LUPINES.

As this plant has not yet made its appearance, that I can learn, in any of the farms in the country, and as the advantage to be derived from its cultivation may, at first sight, appear very problematical, it is necessary that we should make it evident that it possesses some circumstances not only very favourable, but as tending to give it a superiority over most plants that are now used for the very purposes for which I am about to recommend this velly soil, they will grow in; and they seem peculiarly fitted for all worn out sandy and loamy soils, let them be ever so poor and hungry. If the land has received one winter ploughing, and the season has had its due operation upon it so as to pulverize it; I should then harrow it well down in February, and the beginning of March sow them broad cast in the manner of tick beans, and plough them in with a very shallow furrow; if the land has been but lately ploughed, and it is pretty clean, they may be sowed upon the furrow and harrowed in. When the plants are regularly come up, the ground and the crop should be weeded, to cut out docks, thistles, and the like, for, although we profess to enrich the land, we do not mean to say that we can by the same means destroy such roots and weeds as these, which is only to be done by the hoe, the docking iron, and the spud; about the end of May or beginning of June they will come into blossom, and before they set their seed, a second flowering comes on at the lateral shoots; the plants are then full of sap, or vigour, and that is the time I propose to mow them down, and plough them in as fast as possible. If the season has been moderately moist, they will be at this period full of leaves, and strong, and a considerable degree of fermentation will rapidly take place in the ground, the evaporation of which, in its endeavours to escape upwards through the ground, will saturate it with oxygen gas, and the subsequent putrefaction of the plant will produce, in a very complete manner, the effect we are desirous to attain, namely, the decomposition and deposit of a considerable body of alkaline salts. I am not aware of more than one objection to the introduction of this plant for the purpose above-mentioned, which is the scarcity of the seed, and the consequent dearness of it, owing to no other reason than the demand being at present confined to the flower garden; but as it is a plant that seeds freely in almost all seasons, and is at the same time very productive, a sufficient quantity might soon be obtained for the purposes of the farmer. The quantity to be sown ought to be from two to three bushels per acre, and great care is necessary to be observed with respect to the newness and freshness of the seed, which will not vegetate well after the first season.

RAPE OR COLE.

It is not my intention at present to consider this plant as an article of food, but simply in its chasesses more oleaginous and saline matter than most plants, we shall be at no loss to determine why rape ploughed in is so valuable a manure.

Upon all tenacious soils, at the same time that it enriches them, it keeps them hollow, admitting the rains to filtrate, and the sun and air to enter, to sweeten and mellow them. The usual practice is to draw a roller over the crop, and to plough it in immediately, and sometimes an addition of quick lime is made by scattering it over the crop as it lays on the ground before it is ploughed in, which not only quickens the fermentable matter, but greatly increases the powers of pulverization in all retentive soils. As a preparation for wheat, provided the land has been thoroughly cleansed by frequent and deep ploughing, the practice is so far better, and more economical, than a complete summer fallow with a dressing of manure, as the difference is between three pounds and a few shillings. I am not clear whether the intrinsic value of the green crop to the ground is not greater than the dung; but be that as it may, it is an article so cheap, that he would be an injudicious farmer who, knowing himself to be short of manure, would not make use of such a succedaneum. Even charlock itself, which is of the same class with rape, and frequently would overrun many sorts of arable lands in a state of fallow, if it was not early destroyed by ploughing, will, in a certain period of its growth, greatly enrich a strong soil by the salts and oil which it contains in common with almost all plants of the tetradinamia siliquosa class.

RED CLOVER.

The uniform custom among those farmers, whose soil the practice suits of sowing wheat upon clover lay, justly points out to our notice the value of the above plant, in the system of our rural economy. The motive and the practice so far as it goes is undoubtedly good; the fault is that it does not go far enough, unless in the instance of the clover being folded off by the sheep, when the ground receives a dressing from the animals, and the subsequent putrefaction of the roots opens the ground, and eventually enriches it. But, independent of the circumstance of folding the sheep, where the custom is to sow wheat upon the lay without liming, marling, or sowing cinder ashes, how infinitely superior must it be to plough in the green crop in its highest state of luxuriance, which is made into hay, and carted off the ground; or when it is suffered to exhaust itself by standing to ripen its seed. The mere circumstance of a very few weak leaves with the roots cannot, it is presumed, add much to the goodness of the ground, although the latter may, and do, keep it somewhat more mellow and open. I have before observed that the usual mode of sowing wheat upon the clover lay does not suit all sorts of soils, upon all occasions, because it is found to be frequently productive of, and to encourage, the wire worm, &c. particularly on light lands; the cause of which proceeds altogether from the state of the roots, which are not in sufficient abundance to create a sensible fermentation, during which no insects can live; and therefore they generate a sort of mouldiness, which becomes at once their food. If, therefore, the ground is not put into good heart, either by folding the last crop off, or by manuring it, the wheat crop in a dry season cannot vegetate quickly for want of moisture, and that stimulus in the earth which would have been produced by a body of fermentable matter; and thus is sure to be attacked by grubs, wire worms, &c. Having endeavoured to account for the difference in the value of the clover as a manure, I have only to suggest it as my firm opinion, that whoever wishes to obtain the full advantage of this plant must not only give up all other advantages of it except that of folding, but ought also to dress it immediately upon being mown, and before it is ploughed in, with some sort of calcareous manure; and the result will be every thing that can reasonably be expected, let the season be what it may.

BUCKWHEAT.

I have not met with many instances in the county of this plant being sown for the particular purpose of being ploughed in for manure, its principal use being evidently either to attract game, or to be employed as food for horses, hogs, and other domestic animals, in which light I shall hereafter have occasion to speak of it. As a succulent plant, and of very quick vegetation, it possesses a great deal of stimulating matter in the juices, which, after going through the process of fermentation, and being reduced to putrefaction, is found to contain a considerable portion of alkaline salts. This alone is sufficient to recommend it to the notice of the farmer; but when, with this advantage, another is mentioned, which is that of its not being required to be sown until May or June, and

VETCHES OR TARES.

As this plant, in common with the pea tribe, is of the same class and order, that is, Diadelphia decandria, I shall consider them as perfectly synonimous in their present use; because I have not been able to discover any sensible difference in their operative tendency as manures when ploughed in.

Both of them have been resorted to in this county for that purpose, with very great success, in the strong soils as well as in the lighter ones; and as, from the closeness of their growth when fully planted, they may justly be styled smothering crops, they of course prevent the growth of the perennial ones; they also produce so thick a covering, that the sun has no power to dry up the surface of the soil, and the profusion of perspiration from their leaves keeps it constantly moist; thus we have, in addition to their other good qualities as manures, a most powerful argument for their cultivation.

Whatever crop is intended to succeed either of them, the land is made as clean as possible by ploughing, harrowing, weeding, &c. and as the seed is not sown until after the frost is gone, either in January, February, or March, there is time after the preceding crop of corn is carried to prepare the land in a very good manner, if the farmer is so inclined. When that is done, it is the custom with some of the hill farmers to sow three bushels, and of the vale farmers to sow four bushels per acre; the former frequently sow them upon the furrow immediately after ploughing twice in a place, then harrow them in and roll them. And some of those who think four bushels to the acre better, such as my late friend Mr. Ashby, sow two bushels upon the furrow per acre broadcast, and harrow them once lengthways, and across, then sow two bushels more across, harrow them in with the ox harrows, and then with the light harrows every way, making it all as fine as possible; and finish the work with the barley roller. When they come up, whatever root weeds, such as docks and thistles, make their appearance, they are cut up, and the crop proceeds until they are just going out of blossom; when they are either mown or hooked, without which precaution, and supposing it to be a full crop, the plough could not proceed. The plough is set very wide, and a boy follows it to lay the tares regularly into the furrow, to prevent any part of them from being not covered or turned under furrow: so large a body of gross, rank, ve-

MANURES USED AS TOP DRESSINGS.

SOOT FROM PIT COAL FIRES.

Having been given to understand by some very sensible farmers, that there was a very manifest difference in the effects of soot produced from pit coal, from wood, and from turf, or peat; and as the cause of that difference does not seem to be understood, I have endeavoured to collect as much information as possible from every quarter as to the operation of each of them, and from that information, combined with some experiments which I have expressly made for the purpose, I am enabled to subjoin the following account.

Pit coal that comes from Sunderland, Newcastle, &c. is of a very different nature from that which comes from Staffordshire, Derbyshire, Worcestershire, Somersetshire, or Wales; the former contains a great deal of bitumen which yields a great proportion of fuliginous matter; the latter are those which burn like a candle, and consume to a white powder; they contain a great deal of sulphur, and yield but a small portion of fuligo, or soot, compared with the former.

In treating of this subject, I shall confine myself to a definition of that sort of soot which is produced from Sunderland coals, being that which is most consumed in London and its neighbourhood, as well as throughout the county of Surrey.

Soot is that volatile bituminous matter which escapes from the fire, mechanically as it were, along with the smoke, and is forced by the compression of the air in the chimney to attach itself to the sides thereof; where it accumulates from time to time, until by its aggregation it impedes the ascension of the smoke, and it becomes necessary to sweep the chimney in order to remove the body of matter which is there collected.

The soot partly arises from substances imperfectly burned, decomposed only in part, which have escaped the action of vital air. Hence it is, that soot may be burned over again: and hence likewise it is, that when the combustion is very rapid and effectual, there is no perceptible smoke; because all the inflammable matter is then destroyed.

The analysis of soot exhibits an oil which may be extracted by distillation; a resin which may be taken up by alcohol, and which arises either from the imperfect alteration of the resin of the vegetable, or the combination of vital air with the voit has a yellow cast, or when much injured by the wire worm, the stimulating powers of the soot will, if scattered just before rain, soon improve the colour and the face of the plant, which will tiller out, and furnish the ground with a greater number of shoots. For barley, it is sometimes sown with the crop, at other times a fortnight or so after it has come up, provided that rain is likely to follow, but it should not be sown later than April. Some farmers use it for turnips, upon the chalky, gravelly soils, and sow it with the seed, or immediately after it is come up; in either way its success has been conspicuous. The best time to sow it is in the evening when the weather is calm, and always before rain, because, if the weather proves dry, the volatile parts are dispelled and lost, and the crop is in no way benefited by it. Soot is frequently applied to artificial grasses, such as clover, rye grass, and sometimes on sainfoin; on either of these, the greatest care is taken to sow it regularly, and no where too thick, because it has been known to destroy the plants entirely in those places from the extreme heat. It seems abundantly more calculated for rye grass, than for either clover or sainfoin; because, wherever rye grass and clover have been sown together, and the field has been top dressed with soot, the former has grown so rank, and has so far overtopt the clover, as to let scarcely any of it be visible.

Soot, when bought in London, is mixed with every sort of light substances which the chimney sweepers can obtain, such as cork ashes, very fine sifted cinder ashes, saw dust, &c. and their measure too is always short, it being generally concluded by the dealers, that the soot is taken at once to the field without fresh measuring; being well persuaded that the purchasers would not themselves measure it, if it was not so; and, therefore, they do not scruple to practise the most abominable deceptions with impunity.

Having provided the soot, the next difficult matter is to procure a man to sow it. In Hertfordshire, Bedfordshire, and Cambridgeshire, the farming men sow it; but in Surrey, where the practice of sooting does not so much prevail, it is customary to get a chimney sweeper to sow it. It is one of the most disagreeable operations imaginable, for let the air be ever so still, which, indeed, is the only proper time to sow it, the lighter particles of it will hang in the air, and settle about the sower, in such quantities as to make him very soon as black as the soot itself. But that is the smallest ing, whether it be on wheat, barley, turnips, or seeds, is one halfpenny per bushel, and sometimes beer; at this price, an active man has been known to earn from three to four shillings per day, sowing from 70 to 80 bushels and upwards, on a calm still day. With respect to the price it ought to vary with the quality, but as that could only be known by analysis, which is an operation that very few farmers are capable of going through, they are, therefore, obliged to take such as they can get, for which they pay from 10*d.* to 1*s.* per bushel, strike measure; this uncertainty about the quality, leaves the farmer very much in the dark, about apportioning the proper quantity to the acre, from which circumstance he is likely to be as often wrong as right in his judgment of it; however, I shall state what is the usual allowance per acre, strike measure.

The quantity used per Acre is as follows.

Upon strong loams for	wheat	40 to 45	bushels.
Ditto	pasture	20 .. 24	ditto
Ditto	artificial grasses	25 .. 30	ditto
Upon light loams for	wheat	30 .. 35	ditto
Ditto	barley	30 .. 33	ditto
Ditto	turnips	30 .. 33	ditto
Ditto	seeds	20 .. 25	ditto
Ditto	pasture	20 .. 23	ditto
Upon chalky loams	wheat	35 .. 40	ditto
Ditto	barley	30 .. 35	ditto
Ditto	turnips	30 .. 35	ditto
Ditto	seeds	20 .. 25	ditto
Ditto	pasture	20 .. 25	ditto

SOOT FROM WOOD FIRES.

Having in the preceding chapter detailed the combinations of soot from pit coal, we now proceed to examine that which is produced from wood.

Wood soot is of a shining, glossy, black colour, having a disagreeable smell, and a nauseous acid taste. Upon analyzing this soot, whether it proceed from oak or beech, we shall obtain a great quantity of gas. This gas is principally carbonic acid, and may be separated by a solution of caustic alkali. Having done that, we shall find an inflammable gas, which, from its disagreeable empyreumatic smell, appears to possess properties belonging to hydrogen gas, but is different from it, by containing a greater specific gravity, and by having less carbonic acid gas than pit coal soot. This definition clearly proves that the soot we are now describing is different in its essential properties, although it has some in common with the preceding soot, and it is that difference which makes it less weak or injured by the wire worm, to be harrowed or hoed immediately, in order to mix it with the soil, and to prevent the evaporation of the volatile parts; it may be sowed with turnips, or as soon as the seed has vegetated, in which case, it will be proper to sow the soot as late in the evening as convenience may suit, and to run a light bush harrow over it, which will be the means of working it into the soil, and the dews which then prevail will cause the soot to act immediately, and being a remedy against the fly, and most other noxious insects, it may be the means of saving the crop, as well as of improving the quality of the soil.

Upon all cold, clayey soils, this manure cannot fail of being highly useful, not only as a stimulant to the plant, but as a corroborative also, and as well for most grasses, as for corn or pulse.

The quantity to be used per Acre.

			bushels, strike measure	per acre.
Upon strong loams for	wheat	45 to 50	ditto	ditto.
Ditto	pasture	22..26	ditto	ditto.
Ditto	artificial grasses	28..34	ditto	ditto.
Upon light loams for	wheat	35..40	ditto	ditto.
Ditto	barley	33..38	ditto	ditto.
Ditto	turnips	33..36	ditto	ditto.
Ditto	seeds	24..28	ditto	ditto.
Ditto	pasture	22..24	ditto	ditto.
Upon chalky loams for	wheat	40..45	ditto	ditto.
Ditto	barley	35..40	ditto	ditto.
Ditto	turnips	33..38	ditto	ditto.
Ditto	seeds	24..28	ditto	ditto.
Ditto	pasture	23..26	ditto	ditto.

SOOT FROM PEAT OR TURF FIRES.

There is some little difference in the intrinsic properties of soot produced from peat, and that from turf; but as that difference is not of sufficient importance, and as it happens generally, that where peat is burnt so also is turf, I have not thought it an object to separate them. As the first sort of soot, that is the sort which I have described in page 157, was the produce of a fossil, and the second, of the woody tribe of vegetables, so the present, from being more immediately the volatile parts of herbaceous plants, contains a matter essentially different in its contents from the other two; for we find that the saline particles of oak, beech, elm, or fir, in their proportions to that of the earthy, is as 1.5lb. to 17.5lb. or little more than one per cwt. according to the bishop of Llandaff; whereas weeds, and culmiferous plants (or such as have smooth jointed stalks, and their seeds contained in chaffy husks,) contain more earth than trees do, and of saline matter infinitely more;

in wheat, but it also abounds in gramineous plants; in the former it contributes to the formation of the animal gluten, and in the latter it forms a part of the mucilaginous juices of the stalk, as well as of the organized parts of the seed. If this be admitted, and as all plants in all their parts, and all their immediate principles or component parts, when subjected to dry distillation, afford carbonated hydrogen, and carbonic acid gas, most plants contain ammoniac and azot, which, however, do not pre-exist ready formed, but are produced entirely by caloric applied in different proportions; we can therefore be at no loss to account for the operation of this sort of soot. It will now appear, I am persuaded, no longer singular why I separated them; it will also, I trust, again shew the necessity there is for the right understanding of the respective properties of every sort of manure that is used.

In the application of this soot, I have nothing fresh to recommend independently of mixing it with quick lime and fresh loam: of soot and lime an equal quantity, and twice the quantity (of those two combined) of loam; the soot and loam to be regularly mixed, which is best done by passing it through an upright skreen, such as masons and bricklayers use for skreening their lime and sand; the large lumps of the latter will be kept back, or broken fine and passed through it, and after remaining thus mixed for 10 or 15 days, the lime should be added by turning them together; in five or six weeks more the whole heap should be passed through the skreen, which will effectually mix them, and it may then be used at pleasure.

The experiments which I have before alluded to, speak more effectually the qualities of the different sorts of soot to the minds of a farmer, than all the chemical definitions and proofs that can be offered; without them we could reason only from circumstances; but in the present instance, the circumstances and the result of the experiments exactly coincide.

These experiments were tried on a piece of drilled wheat, which, during their growth, I had the honour of shewing to my Lord Egremont, as well as to numberless gentlemen, in the summer of 1802, and perhaps a finer sight of the kind was never seen.

The ground was a potatoe fallow well manured for that crop, and afterwards dug with the spade about 18 inches deep; it was marked out into beds of five feet wide, and four rows of wheat were sown dressed with soot from coals; No. 2, with soot from wood; No. 3, with soot from peat and turf; No. 4, with coal ashes; No. 5, with the finer parts of brick and lime rubbish skreened, but not very good; No. 6, with a mixen of dung, road scrapings, loam, decayed vegetables, &c. No. 7, with coal soot; No. 8, with wood soot; No. 9, with soot from peat and turf; No. 10, with coal ashes; No. 11, with the finer parts of bricks and lime rubbish skreened, but not very good; No. 12, with a mixen of dung, road scrapings, loam, decayed vegetables, &c.

As soon as it was all sown, I ordered the ground to be raked between the rows which let in the dressings, and cleared the ground. In 15 days, which was the 9th of March, I had the beds flat hoed and raked as before. On the 30th day, which was the 24th of March, the crop looked very promising, but the advantage was in favour of the soot. On the 12th day of April all the beds were flat hoed, and as far as No. 6 were again sown with the same articles as at the first sowing, and every bed was clean raked. On the 16th it rained the greater part of the day; the rain penetrated about two inches into the ground, and as soon as it was dry enough to use the hoe, I first flat hoed the beds, and then landed-up the wheat regularly; and in this state the crop was left until harvest; the first three beds went on progressively, but gaining ground of the rest very rapidly. No. 7, 8, and 9, were next. No. 5, 6, 4, 10, 11, 12, followed in that order. On the 1st of June, the crop was the admiration, and I may add, was the astonishment of hundreds of people; for nobody passed it without expressing something in its favour, and in particular, those who were daily in the habits of noticing its progress. It then stood in the following order, No. 1, 3, 2, 5, 6, 4, 7, 9, 8, 10, 12, 11; but between 5, 6, and 4, which had now overtaken and rather passed 7, 9, and 8, the difference was but trifling. At harvest the order was No. 1, 3, 2, 5, 6, 4, 7, 9, 8, 10, 12, 11; the first three numbers were in height nearly one foot above the rest, stronger in proportion, had been free from any blight or mildew, and produced a finer grain. In point of height there was little difference, that which there was ran in the order I have stated; between the six following numbers, the different height was but trifling, yet there was an evident difference in the ears; in the last three numbers the straw was shorter, not so strong, and I discovered among No. 10, 11, and 12, several

The quantity of soot applied to No. 1, 2, and 3, was one bushel to each.

The quantity of each of the other dressings for No. 4, 5, and 6, was four bushels to each.

The quantity of soot applied to No. 7, 8, and 9, was half a bushel to each.

The quantity of each of the other dressings for No. 10, 11, and 12, was two bushels to each.

The red wheat was large and fine to appearance, but was wide and loose in the awns, with a thick skin and coarse flour, so that it was with difficulty I could sell it at a much inferior price to the white, which was in general a very fine full grain, but particularly that which was sooted with No. 1, 2, and 3. I was afterwards sorry that it had not occurred to me to buy a quantity of soot in the usual way of the chimney sweepers, and to have tried it against the three sorts which were as pure as I could get them; for the coal soot was produced from my own fires; and the other two I obtained from a friend near Dorking, who paid particular attention to their purity.

The quantity necessary for an acre should not, I think, vary from the account given in the preceding chapter on wood soot, and therefore it is unnecessary to repeat it here.

MALT DUST.

The article which I am now about to describe is the kiln dust, which falls from the malt in drying. As the quality of this dust not only varies with the quality of the barley which is converted into malt, but also varies very sensibly with the degree of heat which may have been applied during the process of malting, as well as in the manner of making up this dust, so as to avoid taking up the tail dust which passes through the skreen, so it will appear to be absolutely necessary that the farmer should make himself acquainted with these particulars in order that he may be at no loss what quantities he ought to apply according to their relative goodness, without which, all must be mere guess work; and if it fails, the manure is absolutely condemned, when perhaps a larger quantity might have had the desired effect, and have saved the credit of the manure.

As there are a great many maltings in the county, such as those at Lambeth, Nine Elms, Wandsworth, Kingston, Esher, Guildford, Godalming, Dorking, Reigate, and Croydon, one should be led to suppose that all the dust which might be made at those maltings would be eagerly bought up by the when the barley is poor and thin, and from the badness of the weather the malting does not go on kindly, the quality of this dust is inferior to all; because some barley may have shot far and be burnt, while others may have only sprung, and be not burnt at all. In Hertfordshire and Buckinghamshire, where I have used a great deal, I have remarked, that the blacker the dust the more active it was, whether used as a top-dressing for wheat or barley.

There are not wanting farmers in the county, who decry the use of it altogether; they have tried it year after year, and crop after crop, without any apparent advantage. Upon examining more minutely into the cause of this failure, or rather want of success; I have found that it has proceeded from a want of knowing that there was a difference in the quality of it, so as to make it necessary to increase the quantity per acre; and again, no regard whatever seems to have been paid to the time of applying it; from which consideration I may be allowed to say, that it is not a failure of one, two, or three trials, that ought to prevent a spirited man from continuing a manure that has been received as a good one, without actually making himself master of the contents of that manure in a chemical way; and giving it another fair trial after ascertaining its component parts, provided he has the best malt dust that can be procured, and applies it fairly.

What I would infer by the word, fairly, is, that he does not trust the application to his servants only; and that it is not disposed of in a slovenly manner.

It is used with great success upon the stiff loams; the sandy loams, and the chalky loams; for wheat it should be applied in March, just before a change of weather, and should be harrowed in with light harrows; for barley and turnips, it is usual to sow the dust after the seed has been two or three times harrowed, and then to finish altogether by rolling. I have known an untoward season so injure the young barleys as to nearly annihilate the crop, which had been previously dusted, but which was entirely recovered by a repetition of the malt dust; which shews, that although from some ungenial circumstances the first manuring had not been attended with all the success that might have been expected, yet it clearly proves that we are not to despair, nor be afraid of a second application, which is often accompanied with a more than ordinary success, as was proved in the experiments enable the crops to vegetate quickly, and cover and protect the soil on which they grow, from the ensuing droughts of summer. To their almost magical powers, the Hertfordshire farmers are principally indebted for their never-failing crops. Without entering into a chemical analysis to discover the cause, they are satisfied with the effects; and therefore continue to enlarge upon the practice, though attended with considerable expence. The provident farmer lays in a stock of dressings to answer contingencies; and provided with this treasure, he can remedy the evils of bad seed-times and seasons.

The usual quantity sown per Acre is,

Upon strong loams for	wheat	40	bushels	top-dressed.
Upon sandy loams for	wheat	36	ditto	
Ditto	barley	32	ditto	sown with the crop.
Ditto	turnips	30	ditto	
Upon chalky loams for	wheat	38	ditto,	top-dressed.
Ditto	barley	34	ditto	sown with the crop.
Ditto	turnips	32	ditto	

SOAP ASHES.

Upon inquiring into the composition of the ashes above-mentioned, at the different soap-boilers at Christ-church in this county, in the Borough of Southwark, and in Cow-lane, West Smithfield, I find the several materials or ingredients are so different as to account very readily, why in some instances the same quantity of ashes used at the same time, and on nearly as similar soil as possible, should be productive of the best possible advantage to the crop, while in other instances, it has been found to destroy the crop. The reason of all this

I could not have found out, had I not taken some pains to inform myself at the manufactories abovementioned, and afterwards by a chemical analyzation thereof. Indeed, in my several excursions through the kingdom, I have observed the same process to obtain at Bristol, Exeter, Worcester, and Chester; but above all, I availed myself of the opportunity while I was in France, of learning a great deal with respect to the process pursued there, and where their manufactories of this article are in general carried on in a more scientific and chemical manner than most of those in England.

To find out the value of the soap ashes, we must first learn what sort of soap has been made that has produced them, because, as the original ingredients are perfectly distinct in their nature, so their ashes cannot but partake of the same distinction. For ation of soda, with the same substances, affords those called hard soap. It seems, therefore, to be an established fact, that potash combined with any kind of fat can only afford a soap, to which no cooling can give a hard consistence. The addition, however, of a certain quantity of soda, or even muriate of soda, will produce the effect of consolidating it. From this short history of soap, we have an evident proof that the ashes are different in their educts; but it still remains for me to account for the difference of their operations and effects. Leaving the fat and the oils, therefore, out of the question, let us examine the leys, the one the potash, and the other the soda. In the latter we shall find the following peculiar properties: in the fire it is rather more fusible. When exposed to the contact of the air, it attracts water and carbonic acid, but it does not liquify like potash, it merely acquires a pasty consistence, and at last crumbles into powder. It attracts sulphur and sulphurated hydrogen more feebly. It adheres less strongly to the acids. It fuses and dissolves alumine more easily. It is produced by lixiviation from the ashes of burnt plants, herbaceous particularly, and those only which grow upon the sea shores. Potash, on the contrary, is generally procured from woody trees, which grow entirely insulated, and especially the American potash. The rationale of these educts, therefore, is, that as herbaceous vegetables yield more saline matter than arboreous ones, so those plants which grow on sea shores, or where the sea occasionally washes them, must contain more saline matter than even those herbaceous plants which grow insulated; consequently soda is by so much more strongly impregnated with alkaline salts, as the food by which these plants have attained their saline properties appears to be the more composed of salt. From hence we may conclude that the ashes from hard soap are perhaps more than twice as strongly impregnated with salts; and consequently, that something less than half the quantity of these ashes are sufficient to manure that which would take a full quantity of the ashes produced in the making of the soft soap. In examining the ashes that are produced from the soft soap, we shall find them very light and spongy, by which we may infer that their salts have been principally extracted by the lye; on the contrary, the ashes from the barilla or soda are more condense and hard, the parts of it are not so easily separated by the lye, and consequently more of the salts remain behind.

mented it should be turned over, and well incorporated and mixed; by this means, whatever causticity and acrimony there may have remained in the ashes, they will be effectually corrected by the mixture of dung and earth.

Upon all strong cold soils, they will prove of infinite service, whether applied to the wheat crop, or to cold wet pastures; wherever insects prevail, this manure will speedily and infallibly eradicate them.

When made into a compound it may be used at pleasure, without being liable to injure the crop; but if it be used in its neat state, great caution is necessary, especially if it be applied as a top dressing, and the weather should set in hot and dry; it therefore becomes necessary that moist weather should follow, and that it should be harrowed in. Upon the lighter loams it is also an admirable manure mixed, and in a moist season its effects are quickly visible and permanent.

BIBLIOTHECA BODLEIANA

The quantity applied per Acre is as follows.

Upon strong loams for	wheat	2 to 3 cart loads of neat ashes.
Ditto	wheat	10 to 12 cart loads of mixed manure.
Ditto	pasture	2 cart loads neat.
Upon light loams for	wheat	8 to 10 cart loads of mixed manure.
Ditto	barley	6 to 8 & to 10 cart loads ditto.
Ditto	turnips	6 to 8 cart loads of mixed ditto.

WOOD ASHES.

The ashes which are produced from the woods of this county, as they arise from a great variety of trees of different qualities and properties, must necessarily yield ashes corresponding with their original characters, to a certain extent at least.

In order, therefore, that we may benefit ourselves as much as possible by the intrinsic merits of them, I shall endeavour first to examine their constituent parts; and, secondly, to class them. By classing them in the manner proposed, a great deal of trouble will be spared to the farmer; and by having an intimate acquaintance with their relative properties, he can better judge of the proportion of ashes he ought to allow per acre, according to the state of the ground, &c.

It is a very well ascertained fact, that the closer the texture of the wood, and the harder and heavier it is, the greater portion of vegetable alkali it will be found to contain. We have before seen, that the quantity of carbon in trees and vegetables is various, according to their various species, age, and degrees of perfection:, wood and corn contain most, grasses least. Wiegleb found dry beech grains. Yew tree is 0.8070, the weight 3 drachms, 23.5 grains. Apple tree 0.7930, weight 3 drachms, 27 grains. Plum tree 0.7850, weight 3 drachms, 18 grains. Maple tree 0.7550, weight 3 drachms, 10 grains. Cherry tree 0.7150, weight 3 drachms, 0 grains. Pine tree 0,5500, weight 2 drachms, 18.7 grains. White poplar 0,5294, weight 1 drachm, 13.5 grains. From this short analysis we shall be warranted in placing the following list in the order I have pursued, and it is to be observed that the most part, or all the trees, are to be found in the woods, plantations, and underwoods of every county.

In the first Class are

Oak
Ash
Sweet chesnut
Yew
Beech
Pear
Crab
Blackthorn
Broom.

In the second Class.

Elm
Maple
Hornbeam
Whitethorn.

In the third Class.

The pine and fir tribe.

In the fourth Class.

Birch
Alder
Sycamore
Poplar
Hazle
Elder
Sallow.

As the ashes of the harder sorts of woods, therefore, contain more vegetable alkali and carbon than the lighter, it necessarily follows that in the same proportion we ought to vary the quantity of those ashes per acre.

In the interior of the county, the prevailing fuel from the highest classes almost to the lowest, is wood; and that principally oak. Among those cottagers bordering upon wastes and commons, peat, turf, and wood of every sort is burnt, the ashes from which are essentially different from that of wood only. Whenever the farmer buys them, it is the custom to throw them with his own, or else to cart them on the land at once, and sow them from the cart: without paying any regard, therefore, to the prodigious difference there is in the intrinsic qualities of these ashes, can it be possible to distribute them properly? If six loads of the best and purest ashes from oak are sufficient for one acre, ten and twelve may not be more than equivalent to them when produced from hazle, alder, sallow, &c. and by the same rule, if we were to sow ten or twelve loads of oak ashes, because it may have been the custom to sow so many of hazle, &c.

ashes which have been made some time, and have been exposed to repeated rains and all weathers; for the latter will be found in every instance, to have had a great portion of their salts washed out. It is a prevailing custom with most intelligent farmers, to contract with the neighbouring cottagers for all the ashes they may make; and as an inducement to let them have all they have to spare, they furnish these people with wood at a somewhat lower price, which they draw home for them, and they also draw their turf, heath, or peat for them. The motive, however interested, is certainly good, inasmuch, as so much valuable manure becomes thereby applied to the soil; but the advantages would be almost incalculable to the farmer, if these ashes were kept in a brick, or stone dry pit, in order to prevent any accident by fire, and covered at the top, by which the salts would be preserved from being washed away, and the volatile parts would be prevented from escaping.

The powerful effects of fresh ashes, I have often had occasion to notice in all sorts of weather, and in many soils, having frequently taken them from the kiln before the heat was entirely spent, and strewed them on a piece of clover just after the first cutting, when the growth has been as sudden, as the strength and the height of the plants were prominent beyond the rest of the field. Upon backward barley and turnips, upon cold, sour pasture, in a wet season, the result has been as conspicuous.

It is no where customary that I can learn throughout the county, to mix these ashes either with lime, or animal or vegetable substances, because they are generally applied to pasture, either the sour, wet, rushy sort, or the mossy or coarse sort; in either of which cases, the ashes will destroy the rushes, and correct the sourness; but nothing short of draining can effectually remove the wetness of them. The ashes will speedily remove the tribe of mosses, and make their destruction subservient to the purposes of manure, at the same time that the coarse grasses will be displaced to make way for the trifoliums, and the finer sorts of poas.

Notwithstanding, however, we fail to employ wood ashes in combination with other substances, as manure to be ploughed in, or to use them as top dressings, yet there is no question, but their chemical properties would readily combine with many bodies, and produce a manure improved in some instances, and rendered fitter in others, to promote the great purposes of vegetation.

From the analysis I have already offered, we are led to conclude that the ashes produced from the over, in order to reduce the parts as small as possible to fit it for sowing by the hand.

The soils most proper for the application of wood ashes, are certainly the heavy tenacious loams, and the inactive lighter ones, but neither the calcareous nor the silicious soils are at all adapted for them: it seems of the highest consequence, in the application of wood ashes, that attention be paid to the season of the year and the state of the weather.

For grass we generally prefer the autumn, and the day should be cloudy, if possible; they should be sown directly from the cart as equally as possible, to prevent too large a body from burning the grass up to the roots. By sowing them in the autumn the ashes are washed down to the roots, the warmth of them keeps the plants from being chilled during the winter, and they are thus provided with a stimulus to set them at work as soon as the spring season is advanced: for wheat they should be used as a top dressing, and for barley and turnips they should be ploughed in.

The quantity applied per Acre is as follows.

Upon strong tenacious loams	for wheat	60	bushels	top dressed.
Ditto ...... ditto	pasture	30	ditto.	
Upon inactive, cold, dry loams	for wheat	50	ditto	top dressed.
Ditto ...... ditto	barley	40	ditto	ploughed in
Ditto ...... ditto	turnips	40	ditto	
Ditto ...... ditto	clover	30	ditto.	
Ditto ...... ditto	pasture	30	ditto.	

The price of wood ashes is, when dry, 5*d*. per bushel, and otherwise from 5*s*. to 10*s*. 6*d*. per waggon load.

FURZE ASHES.

The ashes produced from furze contain a large portion of vegetable alkali; these are found to possess different degrees of strength, in proportion as they are burnt, either in the brick kiln, the lime kiln, or the oven. It becomes, therefore, of great consequence to the purchaser or the farmer, to attend to this seemingly insignificant point, in order that he may know how, and where, and in what quantities, to apply each of these ashes. As a man may put 20 load of ashes upon an acre of land, when ten would be sufficient, if ignorant of the difference in quality between those produced from the lime kiln, and those from the bakers' oven.

First, with regard to the ashes that arise from furze burnt in the lime kiln; it is well known to superior to the ashes that come from the brick kiln. But the proportion is greater; for it will be found that quick lime eagerly absorbs fixed air, as well from the soil as from the atmosphere, and in no less degree of salts, animal as well as vegetable. When it is fully impregnated with these, its action upon the soil becomes not only immediate, but more lasting, and may be applied in a greater variety of ways.

Secondly, as the burning of the bricks with furze occasions some portion of the soil that is nearest the fire to fall to pieces, which passes through the grating, and mixes with the ashes of the furze, although in much less proportion than either chalk or lime stone, whatever that quantity therefore may be, depending, as it necessarily must, upon the quality of the loam with which the bricks are made, still that quantity, be it much or little, being mixed and blended with the ashes as they severally pass through the grating, is of considerable value when applied to strong deep soils. The clay or loam thus burnt, will be found to contain a considerable portion of the carbonaceous principle, will separate the adhesive properties of those soils, while the vegetable salts are providing a stimulus to the plants; but upon the shallow, thin clays, I do not think they are to be recommended.

Lastly, if the quality of the furze ashes from the lime kiln are superior to those from the brick kiln, for particular soils, how much more superior must both be to those produced from the baker's oven, where neither calcareous nor argillaceous earths can be mixed with them.

That the former are not so stimulating, nor of so forcing a nature, will be readily admitted, because the whole body of the latter, or nearly the whole, is composed of volatile ingredients, whose powers are active and quick, and are soon passed away; hence in all languid and sickly crops which are backward, arising from a want of stimulus in the ground, and from a cold, untoward season, the pure ashes from furze will be infinitely of more service than either of the other two, whose powers being more locked up, are more slow, and consequently more lasting.

In the stiff, loamy soils, with a substratum of chalk, as at Warlingham, Shire, Effingham, Horsley, Clandon, &c. these pure ashes cannot fail of being of infinite use as top dressings. In the strong tenacious loams of Godstone, Horne, Burstow, Horley, &c. and wherever there is more or less iron, the ashes from the lime kiln will be found to be the best, and may be ploughed in for barley and

Upon lighter loams	for wheat	6	ditto	top dressed.
Ditto	barley	12	ditto	ploughed in.
Ditto	turnips	10	ditto	
Ditto	pasture	10	ditto	
Ditto	seeds	8	ditto	

TURF ASHES.

The quality of turf ashes, like every other sort of manure, must depend upon the greater or less proportion of nutritive principles of vegetation contained in them. Thus, for instance, while one sort of turf is composed of short heath, bents, and the like, upon a black or white sandy soil, another shall be overgrown with thick moss, coarse grass, upon a clay, and a third shall consist of wild thyme, sorrel, clover, &c. upon a chalky substratum. Examine the qualities of each of these, and it will be found that the first contains a small portion of alkaline salts, but little carbon and vegetable earth; the second contains a large portion of alkaline salts, oil, and vegetable earth; and the latter a certain portion of oxalic acid and vegetable earth. The first species of turf, pending its incineration, having but a small portion of essential oils, and nothing to imbibe or retain them in their passage through the fire, a great part of them flies off in the form of vapour, and is lost. The ashes, therefore, instead of being fully impregnated therewith, are but little more than a mere caput mortuum. The second sort, being comprised of moss and coarse grass upon a clay, having a greater substance to be acted upon, the fire proceeds but slowly, the absorbent earths attract the acid of the moss, and the grass separates it from them, and readily unites itself with the alkaline salts, &c.

The ashes, therefore, being deprived of the acid of the moss, are found to retain the alkaline salts, and some of the essential oil, and to have acquired carbonic acid gas in great abundance.

The last sort being made up of vegetable and calcareous matter, assumes a new form during the incineration, that is, the acid of the sorrel is disunited by the chalk, as it passes into the state of lime, and the ashes thereof will be found to contain a great portion of fixed alkaline and neutral salts, with phosphat and oxalat of lime.

The first should always be used as a top dressing, either for wheat or clover, upon the stronger loams; the second may be applied as top dressings for wheat, barley, turnips, or clover, upon the deep sandy soils, or may be shallow ploughed in with the barley and turnips; and the third will be very proper in all sorts of deep argillaceous soils,

PEAT ASHES.

The quality of peat ashes as a manure, has been in part anticipated by the detail of the ashes of turf; but there are certain points in the properties of peat which make it necessary for me to separate the description of them. By turf we are led to understand the mere sod before it is burnt to ashes, that has been indiscriminately taken from the waste, whether it be from what is called common or heath, from the hill or dale, but almost always dry; whereas peat, is always moist and humid, and is formed by the accumulation of aquatic vegetable matter, and by the stagnation of water. Their nourishment and growth are promoted by atmospheric air, by the decomposition of water, and by the calcareous matter held in solution, and contained in most water.

Peat is very retentive of moisture, retaining it in a manner similar to that of a sponge. At no time, in this humid and northern climate, can such soils be divested of that superabundant proportion of moisture with which they charge themselves in the autumn, spring, and winter, as well as during the periodical rains in summer. The sun's rays, or drying winds, during the summer season, are excited in conveying away, by evaporation, this surplus moisture; and as heat is known to be abstracted from bodies, and cold generated by evaporation, hence effects will arise injurious not only to climate, but likewise to vegetation in general; but more especially so to such plants as require a greater degree of heat and nourishment, than soils of the above description will admit of. There can be little doubt, that these injurious effects on vegetation will extend themselves even to the drier lands, in the vicinity of such low grounds or peat mosses.

Peat is an inflammable substance, consequently capable of combining with pure air, or oxygen, and of becoming oxygenated; the surface of peat mosses, or what is most exposed to the action of air, is capable of becoming more oxygenated than the under stratum.

The oxygenation of peat, and indeed the combination of pure air or oxygen with inflammable substances, renders such substances less inflammable, a process analogous to that of combustion; in both cases saline compounds are formed which are inflammable.

It is upon this principle that inflammable bodies, when exposed to air, lose their combustibility; it

In peat mosses there are frequently springs of mineral water which contain, in solution, saline, and ferruginous matters. Hence the ashes of peat, besides the earthy matter (consisting for the most part of phosphat of lime,) contain likewise phosphat of iron, gypsum, Epsom salt, and green vitriol; and these in different proportions according to the nature of the peat, and the circumstances under which it had been formed. Hence also, the ashes of different kinds of peat will have different effects, when used as manures, or top dressings to ground.

The decayed remains of vegetables, called inert vegetable matter, abundantly contained in many soils, especially those which have been much manured, and long under cultivation, are in all respects similar to peat of different degrees of oxygenation and insolubility; a process promoted by fallowing, or the exposure of fresh surfaces to the action of air.

In this county, we have some very valuable peat mosses, of no very great extent most certainly, but which are not attended to with that regard to improvement which the quality of them seem to demand. I have examined them with all the circumspection I am master of, and may, therefore, be allowed to say something on the subject.

In the neighbourhood of Merstham, about Hooley Park, and in the valley below Gatton Park, the seat of Colonel Mark Wood, there is a tract of very rich peat earth, apparently of great depth; some of it I learnt was used a few years ago about the grounds and meadows there, and has very much improved them. But, notwithstanding this instance of their great utility is manifest to the farmers in the neighbourhood, I do not find that they have of late years resorted to this manure, owing probably to their prejudices in favour of lime, which is almost as easily to be procured. It is the more to be lamented, because, from what I have been able to discover, the ashes from this peat is not inferior to the long famed Newbury ashes. It is supposed, and generally understood, that the ashes from the Newbury peat are rendered so highly valuable, in consequence of the vast quantity of calcareous matter whish is constantly being carried down from the chalk hills from above, by the rains and floods. If that be really the case, of which I have no doubt, then it will follow, that the peat at Hooley and Gatton are equally good, because they have the advantage of Reigate hill to an equal extent; and as the chalk of the two places is very nearly similar as to the quantity of calcareous earth and carbonic acid contained in them, I am led to think that the quality of the one does not far exceed the quality of the other, if at all.

There are two bogs at Frimley, and one near Henley park, the seat of R. Halsey, Esq. in the parish of Worplesdon, which contain peat of very good quality; these appear to be the only ones that deserve any notice, though there are several lesser ones dispersed over the western part of the county. The bogs at Frimley have yielded to the proprietor, (I believe, Mr. Lawrel,) full £.70 per acre, clear of all expences.

The mode generally adopted for digging the turf, and preparing it for burning, is by cutting drains to let the water off; the turf is then marked out of a certain number of rods in length, and breadth; it is then dug by the hundred, but sometimes by measure. It is afterwards laid to dry, and when sufficiently so, it is made into large heaps, and burnt by a very slow fire, According as the peat is more or less dry, or contains more or less essential oil, or (as it is termed) is more or less fat, according as the weather is favourable or otherwise, and in proportion as the heaps are more or less large, just so much a longer or shorter time will the peat take to consume to ashes; it is frequently seven or eight weeks.

A fire regularly kept up, but burning by slow degrees, will retain more of the vegetable alkali in it, than a more quick one; and in proportion to the heat of the fire, the same quantity of turf will produce more or less ashes: for example, three loads of dry peat, which is about the usual heap, will yield from 6000 to 7000 bushels of good ashes. They are sometimes burnt in single loads, where they have been known to yield 2400 bushels, but it is not often that the peat of this county has produced so great a quantity. The price varies with the quality from 1½*d.* to 2*d.* per bushel on the spot, or about 14*s.* per waggon load; and it is generally used as top dressings for wheat, barley, and seeds, and very seldom that I can learn ploughed in. Where it is very rich in fixed alkali, it may be used with very great propriety as a top dressing, or even ploughed in; but as we lose a great portion of the essential oil by incineration, and as peat moss may be made to undergo the process of fermentation, agreeable to the ideas of my Lord Meadowbank, by which the whole of the essential oil and vegetable earth will be retained, it is a matter of no small importance to avail ourselves of such a valuable process, and therefore I am the more inclined to detail it.

Let the peat moss, of which compost is to be formed, be thrown out of the pit for some weeks or months, in order to lose its redundant moisture. By this means, it is rendered the lighter, and less compact and weighty when made up with fresh dung for fermentation; and, accordingly, less dung is required for the purpose than if the preparation is made with peat taken recently from the pit.

The peat taken from near the surface, or at a considerable depth, answers equally well.

Take the peat moss to a dry spot, convenient for constructing a dunghill to serve the field to be manured. Lay the cart loads of it in two rows, thin layer of dung, then cover it over with peat at the end where it was begun, at the two sides, and above. The compost should not be raised above four feet or four feet and a half high; otherwise it is apt to press too heavily on the tender parts, and check the fermentation. When a beginning is thus made, the workmen will proceed working backwards, and adding to the column of compost, or as they are furnished with the three rows of materials directed to be laid down for them. They must take care not to tread on the compost, or render it too compact; and of consequence, in proportion as the peat is wet, it should be made up in lumps, and not much broken.

In mild weather seven cart loads of common farm yard dung, tolerably fresh made, is sufficient for 21 cart loads of peat moss; but in cold weather, a larger proportion of dung is desirable. To every 28 cart loads of the compost, when made up, it is of use to throw on, above it, a cart load of ashes made either from coal, peat, or wood: or if these cannot be had, half the quantity of slaked lime may be used, the more finely powdered the better. But these additions are no wise necessary or essential to the general success of the compost.

The dung to be used should either have been recently made, or kept fresh by compression, such as the treading of cattle or swine, or by carts passing over it. And if there is little or no litter in it, a smaller quantity of it will serve, provided any spongy vegetable matter is added at making up the compost, as fresh weeds, the rubbish of a stack yard, potatoe haulm, saw dust, &c. And as some sorts of dung, even when fresh, are much more advanced in decomposition than others, it is material to attend to this; for a much less proportion of such dung as is less advanced will serve for the compost, provided care is taken to keep the mass sufficiently open, either by a mixture of the above-mentioned substances, or, if these are wanting, by adding the peat piece-meal; that is, first making it up in the usual proportion of three to one of dung; and then, after a time, adding an equal quantity more or less, of moss. The dung of this character, of greatest quantity, is shambles dung, with which, under the above precautions, six times the quantity of peat, or more, may be prepared.

The same holds as to the dung of pigeons, and other fowls; and to a certain extent also, as to that which is collected from towns, and made by animals that feed on grains, refuse of distilleries, &c.

The compost, after it is made up, gets into a mischievous by consuming the materials. In that season, a stick should be kept in it in different parts, to pull out, and feel now and then, for if it approaches to blood heat, it should either be watered or turned over; and on such an occasion, advantage may be taken to mix it with a little fresh moss. In June, 1796, a compost was formed only two and a quarter peat to one dung; it heated in July beyond the measure of a Thermometer graduated to 110°. Part was allowed to stand, part turned with a half more moss. Three weeks after, (18th August) the heat of the former had descended to 84°, while that of the latter had got up again to above 110°. The heat subsides after a time, and with great variety according to the weather, the dung, and the perfection of the making up of the compost, which then should be allowed to remain untouched, till within three weeks of using, when it should be turned over, upside down, and outside in, and all lumps broken; then it comes into a second heat, but soon cools, and should be taken out for use. In this state, the whole (except bits of the old decayed wood) appears a black fine mass, and spreads like garden mould. Use it weight for weight as farm yard dung, and it will be found in a course of cropping fully to stand the comparison.

Let it be observed, that the object in making up the compost is to form as large a hot bed as the quantity of dung employed admits of, and then to surround it on all sides, so as to have the whole benefit of the heat and effluvia. Peat, nearly as dry as garden mould in seed time may be mixed with the dung, so as to double the volume, and more of it. Workmen must begin with using layers; but when accustomed to the just proportions, if they are furnished with peat moderately dry, and dung not lost in litter, they throw it together, as a mixed mass, and they improve in the art so as to make a less proportion of dung serve for the preparation.

The addition recommended, of ashes or lime to the compost, is thought to favour the general perfection of the preparation, and to hasten the second heat. The lime laid on about the dunghill, as directed, is rendered mild by the vapours that escape during the fresh heat.

Compost made up before January, has hitherto been in good order for the spring crops; but this may not happen in a long frost. In summer it is ready in eight or ten weeks, and if there is an anxiety to have it soon prepared, the addition of stance, viz. on a small piece of fallow, sown with wheat, it was manifestly pernicious

Having thus shewn by what means peat may be rendered of the highest importance to agriculture, I shall only remark upon the preceding detail, by observing, that to effect the complete decomposition of the moss, and to preserve all its virtues in their fullest extent, it is perhaps necessary that the foregoing minutiæ should be strictly attended to; but as some farmers may approve of this peat, but yet cannot descend to these minutiæ, I will mention another way by which it may be brought into a state of perfection bordering on the preceding.

To those who are accustomed to use peat moss, and who have any knowledge of chemistry, it is well known that it contains an acid, in most cases nearly in the proportion of one-fourth of its weight. Its other constituent parts, as I have before described, are, an essential oil, alkaline salts, and vegetable earth. To render these of that value, which independently of each other, the three latter intrinsically possess, we must dispossess the peat of the acid, without which it will neither ferment, nor will it suffer those other valuable particles to be of any use,

Having dried the moss most completely, and effectually reduced it to as small pieces as possible, lay the moss loosely in a body, to the thickness of three or four feet at the bottom of the heap, apply, above that, a quantity of fresh horse dung loosely, to the thickness of about three feet, and leave the whole to ferment. As soon as it begins to settle, thrust in some sticks, and observe its heating, when, if you find it disposed to decline, prepare a quantity more peat, so that this addition, with the former quantity, may be in the proportion of three to one of dung. Let it be thrown up in a round heap as loosely as possible, but carefully mixing regularly over it the fresh peat as you proceed; it may be thrown up to the height of eight or ten feet in this loose way. If the dung and the former peat have adhered together, it must be effectually separated. The driest part of the dung must be thrown into the middle of the heap, and if it is at all likely that the moisture in it is not sufficient to bring on a quick fermentation, it must be sprinkled regularly with water from any stagnant pond, or with urine. Such a body so treated, will ferment in a few days, and pending its fermentation, the natural moisture and steam of the dung, will enter into contact with the peat, and not only discharge the acidity of it, but will most completely saturate loads of lime to nine of this compost. Whatever acidity may have remained undischarged by the fermentation of the dung, will quickly be extricated by the lime. Notwithstanding I have pointed out this addition of lime, as a means of quickening the putrefaction, and correcting the acidity of the peat, yet I am far from recommending the general use of it, for two reasons: first, because I am sure that if the dung is good, and the compost has been properly made, there is no occasion for the lime; and because lime tends to disengage and evaporate the volatile alkali, or ammonia, and confines the application of this manure; for we know that in very thin silicious soils it is not advisable to introduce lime, much less is it proper in calcareous soils; therefore, it is only in the varieties of deep argillaceous soils, that it can be advantageously applied. Whereas, the dung and peat alone may be used with great success, upon all the three sorts of soils; to the two former it will not only increase the staple thereof, but by its retention of the essential oils, it will impart new vigour to them. The same may be said of it upon the thin clays, whereas liming has been used and repeated so often, as to tire the land, in the language of the farmer; the peat and dung will afford a fresh supply of carbonaceous and vegetable matter, and be the means of recovering the tone of the soil to its original state of fertilization.

From what has been said with respect to peat, it will naturally occur, that wherever it is to be had at a moderate expence, no farmer should be without its application, so long as he cannot find a sufficient supply of manure at home, but is obliged to have recourse to extemporaneous assistance. Even upon the supposition that he could supply himself, yet it is not only a desirable practice, but highly to be recommended, to vary his course of manures in the same manner as he would his crops; for land will tire of a constant repetition of the same sort of stimulus; and of this we have a remarkable instance in the case of lime, where land has been known to fail in its produce for years, by the frequent repetition of it, and could only be restored by an abundant supply of fresh vegetable, either in the form of green crops ploughed-in, or by dung, in the same manner as on over-dressing of dung upon seeds or pasture, has been known to destroy the crop.

A doubt seems to have arisen about the proper season of laying on this dressing, some insist upon laying the ashes on in the autumn, and ploughing they are well able to sustain during the whole season.

The quantity usually applied per Acre is as follows.

Upon strong retentive loams for	wheat	16 bushels top-dressed.
Ditto	pasture	12.. ditto.
Upon lighter loams for	wheat	14 bushels top-dressed.
Ditto	barley	12 bushels ploughed-in.
Ditto	seeds	10.. ditto.
Ditto	pasture	10.. ditto.
Upon sandy loams for	wheat	12 bushels top-dressed.
Ditto	barley	10 bushels ploughed-in.
Ditto	turnips	10.. ditto.... ditto.
Ditto	pasture	8 bushels.
Ditto	clover	8 ditto.
Upon chalky loams for	wheat	10 bushels top-dressed.
Ditto	barley	9 bushels ploughed-in.
Ditto	turnips	9.. ditto.... ditto.
Ditto	seeds	8.. ditto.
Ditto	pasture	8.. ditto.

CINDER ASHES.

The quantity of cinder ashes now used by farmers and brick-makers in the neighbourhood of all large towns, but in particularly those who are situate within a reasonable distance of London, exceeds all credibility. The latter use the ashes after they have passed the sieve or riddle to mix with their clay, to make it temper and work better, and the cinders or breeze they use for burning their clamps. The farmers use the ashes as a top-dressing upon their clover lays, sainfoin, &c. upon all strong and tenacious soils, as well as the lighter loams; it is also sometimes used as a top-dressing to cold, sour pasture, killing the rubbish, and preparing the way for a more sweet herbage. Upon light lands with a gravelly bottom, and thin surface, and upon sands, it is hurtful, causing them to burn in hot weather, and to make them more loose. Even upon chalk and limestone grit they are prejudicial, because, in a hot and dry season, they burn up every thing; yet they are often used upon such kind of soils in Hertfordshire, and Bedfordshire, though seldom, I believe, repeated upon the same field, and they consider them to be highly beneficial.

The drier, fresher, and lighter, these ashes are, the better they are for all agricultural purposes. It is usual to sow them with a shovel, either from a cart or barrow, but it is but seldom that they are evenly scattered by the shovel; the neater way is, certainly, to sow them with the hand, which is usually done in March and April. The price is from 6*s.* to 10*s.* 6*d.* per load, according as the demand for the brick-makers is more or less brisk.

The quantity applied per Acre is as follows.

Upon strong tenacious loams for	wheat	60 bushels ploughed-in.
Ditto	pasture	50 bushels.
Upon lighter deep loams for	wheat	50..ditto ploughed-in.
Ditto	pasture	45..ditto.
Ditto	clover	40..ditto.
Ditto	sainfoin	50..ditto.
Ditto	turnips	40..ditto ploughed-in.
Ditto	barley	45..ditto....ditto.

PARING AND BURNING.

Paring and burning, or as it is called, Denshirring, but more properly Devonshirring, is practised in this county to a considerable extent, particularly upon all new inclosures, as well as upon rough old lays. In Effingham new inclosure, General De Lancey has done a great deal, and proposes bringing the whole of his allotments into cultivation by paring and burning. The soil is no where very deep, upon a chalky substratum, and the surface, in places, much interrupted by flint stones. The land which he has been paring is part of Effingham Common, tolerably thick covered with heath, furze, white and black thorn, juniper, &c. to pare which in a proper manner, the labour is among the most fatiguing of any part of the business of agriculture. Wherever the soil is stiff, abounding with stones, strong brush wood, and heath, the instrument recoils so often against the man, and his exertion and pressure is so great, as frequently to force the blood from his nose and mouth, especially if he is an athletic, active young man. In such soils the instrument requires to be sharpened every ten or twelve rods. The mode of performing this operation is as follows:

The workman being provided with a denshare, or breast plough, (an instrument described in the chapter on Implements of Husbandry) and having a stiff piece of board affixed in front of each of his thighs, by leather straps, he forces the instrument forward by the power of his thighs, and not with his breast, as might be conjectured from the name of the tool. Having cut the turf rather thin from one to two inches, but which always depends upon the depth of the soil, he turns it fairly over, or more properly, upside down on his right, by which means the turf lies hollow, and the ground then shews that the whole face of the land is cut clean, and no part left uncut.

When a set of men have taken a job of this kind, they follow each other in the same order as consumes than burns, in consequence of being taken in due time, and the weather proves calm and still, a great portion of the vegetable alkali is retained and preserved in the ashes, and they become invaluable; they are then of a brown colour.

In the present case, and supposing them to have been properly treated, I consider the ashes on Effingham Common to be of the very best quality; for, independent of the quantity and goodness of the brushwood, &c. the soil that is pared up with the plants, and which necessarily adheres to their roots, is perfectly calcareous; and therefore, the ashes cannot but be of a superior kind. It is conjected that every acre will produce from 40 to 50 bushels of good ashes, for which the price was about 50*s*. on the average; the men undertaking to include every thing at that price, except spreading the ashes. The proprietor always furnishes a grindstone, which is usually fixed in as convenient a part of the field as possible. The usual rotation after paring and burning, is to shallow-plough for turnips to feed off, sometimes tares succeed, at others barley and seeds, once mowed, then fed off; wheat, pease, tares fed off; turnips fed off; barley; seeds as before. Sometimes wheat is the first crop taken off, then tares, &c.; but never oats.

Mr. Penfold, who is a large farmer in the same parish, and who is a sensible intelligent man, pared and burned 14 acres of old rough lay, full two inches thick, which yielded him per acre 50 loads of good ashes, and were afterwards fallowed for turnips. At General De Lancey's it was not expected that the acre would yield more than 40 loads; but perhaps that quantity equally well managed, would yield as much alkaline salts as the 50 loads produced by Mr. Penfold from the lay. This is a material consideration; for those who pare and burn should be thoroughly satisfied as to the quantity of carbonaceous matter in the ashes, before they are spread, in order that a full quantity, and not more, may be allowed to each acre. But this has in no one instance, that I have met with, been attended to; and, therefore, the most necessary and essential part of the process has been mere guess work.

In the new inclosures in Frimley parish, almost the only vegetables growing there were short heath upon a black, sandy, moory soil. Here they were paring and burning; but of course the sod was pared very thin, and from its nature could afford but a very small quantity of alkali. The price for this work, including the spreading, was out such precaution, the addition of any compost will be of but short duration, will scarcely pay the first expence, and will leave the land eventually in a state of caput mortuum.

This practice of paring and burning is universally resorted to, by all those cottagers and lesser farmers who occupy land on the borders of commons and wastes, where their encroachments are connived at by the parishioners, and by the steward of the manor who thus increases the fees of his station. With these poor people, the paring is done of every depth, and the ashes are often mixed with fresh soil, hog dung, cow dung, and whatever else they can obtain within themselves in the way of manure; and this compost they lay on without any rule, but frequently in so great a proportion, that in a few years the staple of the soil is more than doubled. Their system of farming it is, however, generally so bad, as to counteract and lessen the value of their exertions, for we find them beginning with oats almost uniformly, secondly wheat, thirdly oats, or else potatoes, wheat, oats and oats, &c. Unfortunately for them, the quantity of land which undergoes this routine, seldom exceeds an acre or two, and by that means, if they have no other land, they cannot consume tares and turnips on the ground, because they have no stock of their own, and when they sell them to the larger farmer, they must take his price, be it what it may, and therefore, it does not answer to them near so well as wheat, potatoes, and oats; or even, when laid down to pasture.

As so many thousand acres of land of various qualities are about to be enclosed throughout the county, in consequence of the number of bills which have passed the legislature, in the last sessions of Parliament, for that purpose; I have no doubt but the practice of paring and burning will be resorted to in a great variety of cases, and it is to be hoped for the benefit of the science, that some accurate experiments will be made by scientific men, upon a large scale, and their effects communicated to the public; for the present, therefore, and until something of the sort is satisfactorily ascertained, we must content ourselves with considering the subject in a rational way, by contrasting the opinions of those men who have argued the question pro and con, and who appear to be equally convinced of the stability and firmness of their own ground.

In doing which, although I may differ in opiferent process, namely, the process of putrefaction, might be considerably increased and extended, shews that the principle is defective in this point also. And lastly, that the ashes of the earth and vegetable matter are of so volatile and active a nature, as to be but a very temporary manure.

With respect to the first of these arguments, it will be necessary to go into some detail to meet a question fairly, which is so comprehensive. I will therefore, first consider the shallow soil. It cannot be denied, when the soil is composed of sand with little or no vegetable matter, either in it or on its surface, as at Frimley, that few ashes can be obtained by paring and burning; but if such land is intended to be brought into cultivation, it can only be done, I presume, by fire, that is, by burning the heath, &c. for to plough it in while green, or when having been cut and left to wither, would be in effect to render the soil lighter, and more loose than it is already; and besides, the vegetables that are ploughed in are of so imperishable a nature, that it would be several years before they would be reduced to the state of soil, and become the food of plants.

Now, although we admit that few ashes will be obtained, yet if the sods be but lightly burnt, and, before they are consumed to red ashes, carried to the ground while hot, spread directly from the cart, and immediately ploughed in, sowed with turnips, fed upon the land, succeeded by a crop of rape, or winter tares as the season may be, but always fed off, and then to apply a compost of fresh, loamy earth, either from head lands, ponds, ditches, or the like, or a good coat of saponaceous earth, whether in the state of lime or marl, followed up with wheat and green crops alternately, fed off, and then to be succeeded by pulse, green crops, and grain, &c. &c. I have no hesitation in saying, that such land, if it is to be kept in a state of aration, will in a few years, not only have its staple more than doubled, but will be always in a condition to bear the heaviest crops. The only thing to apprehend from burning, from this sort of soil, is that want of attention may subject the heath, &c. during calcination, to vitrify, thereby rendering the ashes of no use.

In a calcareous or argillaceous soil, in the former of which the soil may be shallow, and the plants dwarf, yet, there will always arise a quantity of the soil with the sod to burn, which will calcine, and produce all the properties of lime in-future management of the soil and the crops, to supply and make up the deficiency.

The second argument resolves itself into this simple point: that although by the action of the fire you reduce a large substance into a small one, namely, ashes, which contain a certain portion of the vegetable alkali; yet, it is well known, that a large body of it flies off pending the incineration; and thereby the quantity of vegetable food is considerably lessened, probably from one fourth to one half, depending upon such circumstances as the burner (who is seldom interested in the event,) cannot always regulate, even if he was possessed of chemical skill; whereas, were the sods mixt with good fresh horse dung, properly attended to during fermentation, and treated in every sense as you would do a mixen or compost, the whole of the vegetable alkali would be preserved, and the land would not be lessened or injured by the paring and burning, but would be immediately increased and improved. To this it may be answered, that in a cold, sluggish soil, the fire is of infinite service, by producing a degree of stimulation and action in it, which no vegetable matter in a state of putrefaction could do; it is even doubted, whether quick lime, that is fresh from the kiln and pulverized, would produce a stronger fermentation in the soil, than is occasioned by burning the sods and ploughing the ashes hot into the ground. Upon a thin, hot, gravelly soil, the argument must have its weight; we could not pare from such a stratum, and burn, and return to the soil, ashes that would be commensurate with the loss, with the expence attending it, and the certainty of having added to the complaint which formerly attached to it, namely, that of its being already too hot.

The last argument will not hold good generally. If the soil is deep, containing much vegetable matter within it, a great deal of brush wood of different sorts, and coarse grasses on its surface, if the soil is wholly composed of inert vegetable matter, such as peat, and if the whole sods of either of these productions are as lightly burnt to ashes as possible, I am very much disposed to think, that they are so far from being superactive, and consequently but of a short duration, that if a proper rotation of crops is pursued, the practice is among the most lasting improvements in the way of manure, that can be made upon an estate; but it ought not to be trifled with; it cannot be expected in the nature of things, that its full benefits are to be extended to ten or a dozen successive exhaust-however, is the practice of the country about Effingham; but other places have their peculiarities, as may be perceived by the following account.

Early in the spring they begin to pare the ground, and, according to the state of the land, whether it has been before cultivated or uncultivated, and to the natural depth of it; they pare the former about one inch, and the latter about two inches, the breadth depends upon the instrument, but the usual length is from 24 to 30 inches; if the land is not much covered with black and white thorn, strong furze, juniper, holly, heath, &c.; all these obstructions, although they increase the labour, as well as considerably enhance the price of cutting, yet the intrinsic value of their ashes will more than compensate any such advance. If a succession of dry weather ensues, the sods will in general be sufficiently dry in five or six weeks, and without being turned; but as it can hardly be expected, taking one season with another, that it should be free from wet for so long a period together, when that is the case, they take a longer time to dry, and require frequent turning; but in a wet season, they imbibe so much moisture, as to cause them to vegetate, sending out fresh roots and shoots in every direction, no pains and trouble should be spared in employing women and children to turn them frequently, setting them up on their edges in an angular and circular form, in order that the wind and air may draw through them. The moment the sods are discovered to be sufficiently dry, some dried furze, or straw, or brushwood are placed in small quantities at certain distances around, and upon which the sods are piled, with the exception of a small part left for an opening for the fire to be put to the pile, and if necessary, a hollow for a chimney; these sods are piled the one upon the other, with the grassy side downwards and in thickness to suit the convenience of the burner. As expedition is a very material object in this operation, and as the success and quality of the ashes depends in a very great degree upon the attention that is paid to the burning, we find that the heaps are made larger or smaller according as the state of the weather indicates fine or wet. As fast as these heaps are made, (and the earlier they are begun in the morning the better,) they are set fire to, by putting some lighted straw into the opening, which is almost uniformly left on the windward side, and closed up when the fire has taken proper hold of the sods.

If the fire burns fiercely, it is necessary to damp as soon as the inside, it will be proper as fast as the heaps fall in, to let the women or men open the ashes, and put those sods that are not entirely consumed, upon and among the burning embers, in order that they may receive their share of burning, which must occasionally be assisted by fresh combustible matter, wherever and whenever required.

According to the state of the weather, and the size of the heaps, they will be burnt to ashes in two, three, or more days, and if a sufficient number of them are not burnt of the first parcel to allow of the ploughs being used, the ashes, whether coarse or fine, should be shovelled close together to prevent the volatile parts of the salts from escaping by exposure to the air. The better way, therefore, is, not to set fire to any of the heaps until a sufficient number of them are formed, so as to clear ground enough to admit of a day or two's ploughing without interruption, and then the work will go on regular. When that is the case, the ashes should be spread while they are yet hot, equally over the ground, except where the heaps were burnt which will require none, and ploughed in shallow as quickly as possible, not only to preserve the essence of the ashes, but also to distribute the soil of those places where the heaps were burnt, in their quick calcined state. It will often happen from various causes, such as dampness, a greater body of soil, or the inattention of the burners, that some of the sods are partially calcined and not reduced to ashes; they are, however, not to be rejected on that account, because they contain more or less alkali in proportion as they are more or less burnt;

and require to be distributed so much the thicker, when they are less burnt, and to be chopped in pieces in order to their being regularly ploughed in.

If in the process of burning it should happen to rain, it will not only retard the work, but, without great care, the fire may be put out before the heaps are properly burnt, which would create a great deal of trouble to renew the fires and the ashes would be of less value, because some would be over burnt and white, and perhaps vitrified, while other parts would scarcely be burnt at all; but should it only rain gently, it will rather improve the process of burning, by keeping under the violence of the fires, nor will a gentle shower injure the ashes after they are shoveled into a heap; it will cause the external parts to run together, forming a crust, which will prevent the volatile parts from flying off, and will also prevent the

the parties may have an interest in the slow progress of the work, by which they may be induced to attend with becoming diligence to the minutiæ of it. At the same time it must rest with the proprietor, to see that sufficient assistance is at all times at hand, to take advantage of and to guard against the sudden changes of the weather. When the work is agreed for by separate engagements, the paring at one price, the burning and spreading at another, the price of the former is as variable as I have before stated, but the latter is more uniform, seldom exceeding 6*s*. per acre, and never under 4*s*. per acre.

Besides the before mentioned process, I have this season seen another which answered extremely well, and was attended with little other expence than the paring. It was done in the following manner; the turf being pared in the month of May, and turned completely upside down, was left in this state to dry; as soon as it was found to be sufficiently so, some dry wheat or rye straw was placed under the sods at different places and set fire to; as the row of sods were laid close together, and as the brushwood grasses, &c. were alike dry, or nearly so, the fire readily communicated from one to the other, and burnt in some places with great fury; but the same precaution being taken in this instance as in the before-mentioned case, by damping the flame with other sods or earth; it was found that nearly the whole of the allotment was calcined with tolerable regularity; much of it was reduced to ashes, and the remainder sufficiently burnt to be knocked into pieces with only a common hay fork. By this operation, not only the sods were converted into a volatile or vegetable alkali, but the whole of the ground had received such an advantage by the fire, that whatever roots might have been left therein after paring, or whatever insects might be secreted in the ground, both of them were destroyed, and both of them assisted in forming, in conjunction with the calcination of the soil, a principle of vegetation, highly enriching and nutritive. As soon as the sods were burnt, the fires out, and the ashes sufficiently cool to admit of horses trampling over them, the ground was well bush-harrowed in every direction, and immediately ploughed for turnips. The bush harrowing dispersed the ashes, and separated the sods that were not reduced; and the lacerations of the soil by the sharpness of the brushwood, admitted the finer parts of the ashes, (which might otherwise have flown off) into it. If that had not been the case.

hollies, birch, furze, sallow, broom, heath, and fern; in order to get rid of all this trumpery at an easy rate, he gave orders for his servants during his absence to set fire to it early in the spring, while vegetation was at a stand and the weather was dry; he had flattered himself that if he could destroy all this rubbish by burning, without at the same time lessening the staple of the soil by paring, there would arise a sufficiency of alkaline salts from the fire to enrich the soil, which would be instrumental in bringing into existence a very fine herbage. But notwithstanding the fire spread rapidly on all sides, threatening with destruction every thing that might be in the way; yet it neither destroyed the birch, the fern, nor the sallow.

The stems and upper parts of the shoots of the trees were killed, but the roots were uninjured, received fresh vigour by the calcination, and shot out with such strength, and in such abundance, as plainly shewed that some very active stimulant had been the occasion of it; and which could proceed from no other cause, but the quantity of salt engendered by the burning of such a vast body of vegetable matter.

The fern was the strongest and best I ever saw; this plan, therefore, did not succeed; because the natives, or those plants which were in possession of the ground, had taken such hold of it, that it was impossible the finer grasses could stand any chance of vegetating, much less of supplanting them. Probably had a second fire being lighted up, and been supplied here and there with the tops and stems of the birch, sallow, &c. together with any extraneous combustible matter, and especially about the thickest of the brushwood, I think it is possible that the second burning would have been more slow and sure, would have taken hold of the ground, and so scorched the roots, as not only to have produced an immediate decay, but to have afforded a great deal of vegetable matter for a new species of vegetation. At least I should have been tempted to have tried it; and I am not clear whether the best time for the second essay should not have been when the sap was rising, and vegetation was exerting itself and making its appearance. I think, every species of plant then feels every check more seriously, than at any other period of its growth, and especially if that growth is languid. As a great part of this land was only fit for pasture or planting, and as the former was the great object; could so cheap a mode of clearing that a difficulty should arise as to its ability to be easily recruited? If that is the case, we need not be astonished at the repeated declarations that paring and burning is among the worst practices that can be established. With those farmers who unfortunately have succeeded a man whose practices have corresponded with the account just related, it is to be expected that they will object to the system, because they may be labouring under the difficulties and losses of recruiting a soil so injured; but if that is their only objection, they may with as much reason object against farming altogether, because few are lucky enough to follow a man of science, and who is above the narrow mindedness of running down a farm by cross cropping, &c. under the paltry idea, that it shall deter other people from offering more for the estate than he already pays, or may choose to offer, on account of the badness of its state and condition. Besides, we ought to consider, that if our soil is shallow, and we render it by any means shallower or worse, whether by paring and burning or not, we ought so to consult its situation, as that it may in a few years become recruited in quantity and quality; and this is best done, not by laying on two inches of dung at first as an equivalent for so many inches of soil pared off, because that would effectually injure the succeeding crop, but by such a rotation of crop as will bring in its train an imperceptible increase of soil, of much greater value than any present compost that can be laid on. As to the mode of doing it, the ways are so multifarious in the hands of the skilful agriculturalist, that it would only be trifling with him, and perhaps altogether unnecessary to particularize any of them here, were we writing for their information only; but as that is not the case, I shall subjoin what appears to me to be a very elegible method of doing it. The turf having been pared and burnt, and the ashes spread as even as may be, should be shallow ploughed-in; in three or four weeks it should be well harrowed down, the tines going to the bottom of the furrow, in order to mix the ashes better with the soil. It should then be cross ploughed two or three inches deeper, and a few days afterwards harrowed down. If the soil happens to be light, from 80 to 100 loads per acre of fresh soil of a stronger quality, or the same quantity of any good compost, should be laid on; if the soil is tenacious, the same quantity of chalk or lime per acre as is usually laid on fallow, viz. 100 to 150 bushels, either of them should be well

As soon as that is done, clap the plough in somewhat deeper than at the last ploughing, let it stand a few days, and then harrow it to pieces as much as possible; plough it immediately as deep as you can, not being afraid of bringing up some of the under stratum; and with the drag-harrows draw them across, being previously loaded to make them go to the bottom of the furrow, and in a few days land-up the ground for sowing, which should be as early in June as possible, sow it with Norfolk turnip; and after being twice hoed, let them be fed off on the ground before Christmas.

That being done, plough up the ground to its full depth, as rough as possible; as soon as the frost is gone, in January or beginning of February, harrow it down and plough it shallow across; the first week in March harrow it down, and plough it up for barley, which sow immediately, and 14lb. of red clover; feed off the first clover as early as possible, and plough in the second growth as soon as it is in full flower, and let it be turned clean under the furrow. As soon as the fermentation is over, harrow in your wheat, and run the roller over it; early in the spring run the harrow lightly over it, but the roller use more freely, in order to close the soil about the plants, and to prevent its cracking from the hollowness of the ground. This crop will ripen at least 10 or 15 days earlier than the same grain sown on the same farm that has not undergone the same treatment. Throw in some etch turnips upon one ploughing, which feed off early enough for some early white pease, or Marlborough greys, to be sown after one ploughing, and sown in drills, which must be twice hoed at least; after this crop is off sow winter tares upon one ploughing, which feed off early in May, if possible, and sow rape, which may be fed off for winter wheat. If it cannot be consumed before Christmas, then sow spring wheats. By some such routine as this the land will be continually swelling, and gaining both in quantity, and I may add in quality too, almost by every crop; and I think I may venture to say that it cannot fail of being always found both clean and in good heart, and improving the fee simple of the estate in almost a compound ratio.

CONCLUSION.

In discussing the subjects contained in the preceding chapters, I have endeavoured to detail the opinions of some of the best informed farmers in view the farmer will readily perceive how many loads of manure it will take to dress any field per acre at certain distances.

	Number of loads per acre.							
No. of heaps to a load	1	2	3	4	5	6	7	8
At 5 yards distance	193	96	64	48	38	32	27	24
At 5½ yards distance	160	80	53	40	32	26	23	20
At 6 yards distance	134	67	44	33	26	22	19	16
At 6½ yards distance	114	57	38	28	22	19	16	14
At 7 yards distance	98	49	32	24	19	16	14	12
At 7½ yards distance	86	43	28	21	17	14	12	10
At 8 yards distance	75	37	25	18	15	12	10	9

Explanation of the first two rows of figures.

The number of heaps of one load each, laid at five yards distance, is 193 to cover an acre;—two heaps to a load, 96;—three heaps, 64; and so to the end. Each of the succeeding rows of figures to be read in the same manner.

I have one observation more to make which appears to me necessary in order to prevent any misapprehension about the term load, which is, when I speak of loads of any article of manure, I mean a cubical or solid yard containing 27 bushels, unless when I expressly say waggon load; and that I would mean to contain 54 bushels, which is of course the Winchester measure.

GRAIN CULTIVATED.

WHEAT, OR TRITICUM HYBERNUM ET ŒSTIVUM.

Triandria digynia, Linn. Sp. Plant.

There are about 50,000 acres cultivated annually with wheat in this county. Professor Wildenow, in his very elaborate edition of the species Plantarum of the celebrated Linnæus, enumerates no less than 18 distinct species, exclusive of the several varieties; of which ten of these species are annual, and eight of them are perennial.

In examining the several fields of wheat which have fallen under my observation in the course of this and the two preceding seasons, I have discovered not only the following species, and their varieties tolerably distinct, and preserved as such by the attentive farmer, but I have also found some varieties which are not here enumerated, and which, if properly understood and carefully attended to, would preserve their distinct characters; and by being perhaps indigenous, might become a valuable acquisition in the hands of a skilful agriculturalist, not only to himself, but to the public. Unfortunately, however, although such an admission has been readily made by two or three very

2. *The Cobham Brown.*—A coarse wheat, great bearer, very hardy, suits strong soils.
3. *The American Red.*—A small thin skinned wheat, hardy, good bearer, suits strong soils.
4. *The Coned Wheat with Long Awns.*—A coarse wheat, strong straw, great bearer, suits clays.
5. *The Red Lammas.*—A bearded wheat, thin skin, good bearer, suits cold soils.
6. *The Yellow Lammas.*—A bearded wheat, prime bearer, suits strong or light soils.
7. *The Hertfordshire Whites.*—A tender wheat, thin skin, kind bearer, much grown in Hertfordshire and Bedfordshire for the straw, suits all loams and sands.
8. *The Fulham Wheat.*—A coarse wheat, thick bran, not valuable, suits strong soils.
9. *Spring Wheat without Awns.*—A thin small wheat, good bearer, suits all warm soils.
10. *Spring Wheat with Awns.*—A hardy coarse wheat, good bearer, fast grower, suits stiff soils.
11. *Taunton Dean.*—A hardy brown wheat, good bearer, fine flour, suits stiff soils.
12. *Dwarf White Wheat.*—A very fine short-eared wheat, thin skin, fine flour, millers very fond of it, straw pale and short, good bearer.

OF THE PREPARATION OF THE SOIL, AND THE MANNER OF SOWING.

The following beautiful Lines from the celebrated Rowe, *I cannot refrain from inserting in this place, as indicative of this great Annual process.*

> " Mark with what hopes upon the furrow'd plain
> " The careful ploughman casts the pregnant grain;
> " There hid as in a grave awhile it lies,
> " Till the revolving season bids it rise;

"Till nature's genial pow'rs command a birth,
"And potent call it from the teeming earth:
"Then large increase the bury'd treasures yield,
"And with full harvest crown the plenteous field."

Lady Jane Grey.

It will not be necessary for me to enter much at large upon this subject here, because the reader will find it sufficiently treated upon under the heads of Fallowing and Ploughing. (See Index.) I shall, therefore, briefly say, that after the land has received the number of ploughings and harrowings which the convenience or the industry of the farmer has enabled him to give it; and having been either dunged, limed, marled, or folded, before the last ploughing, which generally takes place either in July or beginning of August; by some it is then landed-up in September, and in for which I recommend the following method. If it is a one year old lay, that is, the seed having been sown the preceding season, and if it is a matter indispensible to make hay of the first crop, it should be cut as early as possible, and after it has acquired a tolerable bite, it should be folded off, or if sheep are not to be had, it should be dressed with coal ashes, or some other manure, as soon as the crop is carried; in a month the clover will have made a great shoot, and either in the one case or the other, it should be ploughed-in at that time, turning the furrow clean over, and then leaving it until sowing time, when the whole vegetable matter will have undergone its proper fermentation, and will be in a fit condition to receive the roots of the wheat. If it is a two year old lay, I recommend the first crop to be folded off, or dressed early with any of the aforesaid manures, and the land to be ploughed up quickly after the fold, or when the plants are in blossom; and should it have been dressed either with ashes or lime, the fermentation will take place immediately, and the whole will be reduced to vegetable earth, full of the richest salts that can be imagined. After the seed is sown, it will be necessary to let the roller follow the harrow. The same treatment as to ploughing for a wheat crop should follow tares and buckwheat.

Upon pea or bean etches, the ground is sometimes skimmed over with the skim plough, the weeds harrowed and burnt, the seeds sown upon the land and ploughed-in. Upon other farms, the land is only once ploughed, the seeds harrowed in, and the weeds that may be collected by this harrowing are carted off the ground; in both these cases there is at least one ploughing and harrowing, but this is not enough for good husbandry.

STEEPING.—Before the seed is steeped in any liquid, it is necessary that it should be carefully examined, because it may turn out, and often does upon such inspection, that it may already have gone through one course of steeping; I mean that it may have been got in rather damp, and being full of weeds it may have sweated and heated in the mow more than is necessary for the convenience of thrashing it out freely, and if its vegetative powers are not injured, it will nevertheless bear the less steeping. To ascertain which examine carefully the end of the grain: if you find it tinged with a little more red than ordinary; or brown, if a red wheat, you may rest satisfied, that it has undergone one process of fermentation;

its degenerating if he follows the practice which I have laid down,) his best way is to procure the seed from a farmer, whom he knows to be a little more curious than ordinary, and whose land is of an opposite quality with his own; but he must take care not to buy from the jobber, unless he happens to be his very particular friend, and even then, I should almost doubt him; for they seldom sell any seed until they have married it; and, according to the number of jobbers' hands through which the seed may chance to have passed, just so many times it is likely to have been mixed. A solution of brine and urine, and unslacked lime, or a decoction of lime and soft water, are used by most farmers. The grain is put into a tub with a hole at the bottom, and that tub placed over another tub. Upon the grain the solution is poured, it is carefully covered up, and after remaining 12 or 14 hours, all the seed that is found swimming on the surface of the liquor is carefully skimmed off. The liquor is then let off into the lower vessels, the grain taken out and spread on the floor, upon which lime that has been reduced to powder by slacking is put, and mixed up with it, which prepares the seed more readily for sowing, and protects it also more effectually from vermin. This operation is repeated until a sufficient quantity of seed is prepared; but no more ought to be done than can be sowed each day; for although the seed will keep for some time, yet it will certainly lose a portion of its active vegetative powers: the pores (if I may so call them,) being distended by the liquor, and not sufficiently closed by the lime, will necessarily admit and imbibe more or less air, which will dry up the parts so exposed, and consequently injure the parts of vegetation. The mode of using the decoction is by pouring it hot upon the seed, turning it over and over very quickly, and mixing it with lime. But a very good steep is made with tobacco, yew tree, savin, and lime, or nitre, &c. Water, poured boiling hot upon the last summer's shoots of yew and savin cut small, and suffered to remain 48 hours before the seed is put in the liquor, is then strained off, and the seed put in for 20 hours; the same tobacco, yew, savin, and lime, or nitre, with a small addition of each, will make another solution, and the former water will also do again. The seed is afterwards mixed with lime. Another capital recipe I have seen used, and have made trial of myself, is this: to 20 gallons of water put half a bushel of quick lime, to that 4lb. of black soap, 4lb. of tobacco, a spigot and fosset to run the water off the lye. Procure a box that will hold about four bushels, with a wire bottom like a sieve, made fine enough to prevent the seed passing through it, put into it, two bushels of grain, plunge it into the water, and stir the grain well about.

Let all the light grain that rises from time to time be as often skimmed off until no more appear. Turn off all the water, which will carry with it the filth, seeds of weeds, and other impurities which may have subsided during the stirring. Fill the cask again three parts full with clean water, and one part of urine, to this add as much sea-salt, as with a small proportion of nitre, will make a lye strong enough to swim an egg.

The box and grain is now plunged into this lye, and being again stirred and skimmed, is left to steep for 24 hours, when the lye is let off. The seed is then taken out, and mixed with soot, wood or turf ashes, and powdered lime finely sifted; sweep it all about together until the grain is quite dry, and then sow it.

Diseases.—It was a very frequent remark, and not less true, perhaps, than extraordinary, of that great father of physic, the renowned Hippocrates, " that the whole man from his birth is a disease." Ολος ανθρωπος ἐκ γελετῆς νȣ̃σός ἐςι, are his words. He might have added with equal propriety, that vegetation also, if not the whole of animated nature, was alike a prey to its all grasping power, and by being so subject to disease, life becomes the more uncertain.

There is no man, I presume, who has ever paid any attention to vegetation, that is not thoroughly satisfied, that in every stage of its progress it is subject to very many diseases, either proceeding from something hostile to its growth in the soil, such as vitriol iron, &c., from the variableness of the weather, or from the attacks of the numerous tribes of insects with which the earth and air abound; from some one of these causes have arisen all the diseases to which plants are subject. These diseases as far as they relate to corn are commonly classed under the following names:

The smut, called by the French pourri, in Latin fuligo.
Burnt grain, ... charbon, ... ustilago.
Mildewed corn, ... grains rouillés, . . rubigo.
Abortive corn, ... grains steriles, . . abortio.

There are other diseases, of a more minute nature, that are not worth occupying our time about, as the above are the most frequent and most fatal stand conspicuous, have each of them published their thoughts upon this interesting subject, which throw great light upon it; and the former gentleman presented my father, a few years before his death, with all his works, together with some papers upon the diseases of seeds and fruits, which he never published; all which falling into the hands of my brother at my father's death, were mislaid, and I have endeavoured to find them without success, in the expectation of discovering something worth communicating.

Our English writers on agricultural subjects, having seldom hitherto any chemical or botanic knowledge, have not been able to go sufficiently deep into an accurate investigation of the subject, which plainly appears to be the case from the manner of their treating the question, and the vast contrariety of their opinions. The Rev. Doctor Hales, who is the only author that has united great philosophic knowledge with any portion of practical experience, formed an idea, that smut arose from the corn being bruised by the flail, but he soon convinced himself that he was mistaken, for the bruised corn which he sowed purposely for the experiment, vegetated, and the ears were not attacked by the smut; he was therefore obliged to assume fresh ground, and to go through a series of experiments of a different nature; and in order to do that he began de novo, and observed that nature in order to supply the young growing shoots with plenty of ductile matter is very careful to furnish at small distances the young shoots of all sorts of trees with many leaves throughout their whole length, which serve as so many jointly acting powers placed at different stations, thereby to draw with more ease plenty of sap to the extending shoot.

The like provision has nature made in corn grass of the cane and reed kind, the leafy spires, which draw the nourishment to each joint, being provided long before the stem shoots. Whereas the slender stem would most easily break and dry up too soon, so as to prevent its due growth, had not nature, to prevent both those inconveniences, provided strong theca's or scabbards which both support and keep it long in a ductile state. The wetter the season, the longer and larger shoots do vegetables make, because their soft ductile parts then continue longer in a moist tender state, and thence he infers that vegetation is more liable to be injured by sudden cold, winds, frost, or excessive dry weather, either of which by checking the circulation of the sap, Another observation which I have made on the stems and leaves of diseased plants, is, that the matter which they perspire is infinitely less in quantity, and essentially different in quality; it appears through the microscope in small globules, is more viscous, somewhat acrid, and more like animal virus than the perspiration of plants in a highly vegetative state. In attending to these plants through a whole season, I have always found it so; it is not confined to corn alone, but plants of all sorts are in the same situation. I have invariably found them attacked more or less by animalculæ of different sorts, particularly papiliós, which appear to feed on this virus; and the time of day most preferred is from one P.M. to five or six o'clock in the evening, during which period the plant is in the greatest flow of perspiration. The roots too will be found white with a sort of mould, a prey to millepedes and other insects; but they are sometimes also black, or grey, according to the extent of the disease.

A circumstance by no means unimportant, and scarcely ever attended to by any description of farmers, but which deserves our most serious attention, is, that whenever the finer sorts of grain, hedge row wheat for example, is mixed in very small proportions with a strong, growing, hardy, brown wheat, and any part of the field happens to be attacked either by smut, ustilago, or mildew, it falls in nine instances out of ten upon this tender sort; the reason of which is very obvious. The coarser hardier grain, not being so choice in its food in various soils, drawing more nourishment from it than the more tender sorts; notwithstanding a cold, wet autumn, with all the variableness of the winter, the cold, chilling blasts of April, and the frosty nights of May, will be found to flourish, when the other is only making a feeble attempt to get forward; eventually, the coarser grain greatly out-tops the tender sorts, and thus the rain, the heavy dews, &c. after having first lodged upon the tall plants, are shaken off upon the lower ones, which, becoming superabundantly charged, a great deal falls about the spathæ which incloses the future blossoms, finds its way into it, chills the part which of all others is the most tender about the plant, and produces either smut, or ustilago; for upon opening some of the spathæ of such plants as were turned yellow, a quantity of water, in some thick and dingy, and in others more pure, was found generally lodged there.

The ingenious Mr. Tull, whose skill as an agriwas, that he mistook the effect for the cause; for it was nothing more than that the plants, by the removal, were in the first instance checked, and secondly, by being transplanted from, I suppose, a dry soil into a wet one, and in troughs too; they became so stagnated and injured, as to bring forward the disease much earlier and stronger than it would have happened had he left them alone. If he had transplanted a certain number of equally strong plants into different gradations of moist to dry soil, he might have proved something; but he tells us that there was smut found in the fields from whence the plants were taken. It might so happen, however, that the plants might have the disease in embryo, for he does not assert to the contrary; therefore, upon the whole, I think but little of this experiment. I had some smut, and many plants attacked with ustilago, in one piece of wheat in the summer of 1802; owing to the carelessness of my bailiff, who, by mistake sent me a wrong sack of wheat. I very soon discovered that something was the matter, by the sickliness of many of the plants, and upon examining the few seeds I had left, I found my conjectures strengthened; I frequently pulled up, and occasionally took up carefully with a spade, several of those sickly ones, and found them to emit a very strong fetid smell.

As the sort, which I meant to have had sent me, was perfectly free from every sort of disease, I could not but suspect a mistake from these concurring circumstances. Being, therefore, determined to avail myself of the misfortune, and to gain as much insight into the nature of such dis eases as might arise, I let many of the plants continue, but several of them died. I examined every one of them, and found a dinginess, and some black stripes, to pervade the point of the coronal shoot; the husk or shell of the seed to be mildewed or mouldy, and adhering to the plant. When the spike was fully formed, there was a contractedness in the general habit, a greenish yellow in the stem and leaves, the plants much lower than the rest, the same appearance in the roots as before described, but with a much stronger smell, particularly after the smut became discernable. I trusted nobody to eradicate the diseased plants, but performed the operation myself as fast as I could discover them, and always before the plants came into blossom, by which means the whole piece became clean and perfect, and yielded a fine sample. In the same field was a small piece of the sort of wheat I had was generally much taller; but I did not perceive that it was any weaker, or as it is called drawn up, than the rest; the ground was evidently much drier than the other parts of the field, occasioned, no doubt, by the greater quantity of moisture extracted from it, to answer the purposes of this increased vegetation.

Whether, therefore, it was the wall which by its shelter broke the force of the south west winds, and encouraged the growth of the coarser grain, (for it was a mixture of all sorts,) and by outtopping the finer sorts, as I have before-mentioned, produced this phenomenon, I shall not pretend to say. It could not be owing to any difference in the quality of the ground, for it was all alike; and it was evident, that the diseases were almost exclusively confined to the tender sorts, very little, indeed, being found among the hardy ones. It certainly gave me a lesson never to mix grain upon any occasion, but to sow every sort as pure and distinct as possible; and such I would recommend to the attention of every farmer.

Some farmers have lately assured me that they have always found more smut among corn that had been very early sown, than among that which was sown later; but that can only have arisen from some particular cause, which I am not at all prepared to account for, unless it be from the soil, situation, or the foulness of the land. I think it could never proceed from early sowing; because Mr. Ashby, whose experience, abilities, and great success no man ever doubted, always recommended what he himself practised; and I have heard him repeatedly declare in the presence of a room full of

Surrey farmers, that he always found that corn to be the largest, finest, and freest from disorders, which was sown before harvest, and so progressively as fast as the land could be got ready. This opinion seems much confirmed by the practice of the French farmers, who, in 1802 had sown nearly all their wheat lands by the end of September.

Alike erroneous must be that opinion, which maintains that large full bodied wheats are much more liable to produce the smut than seed of middling size. It cannot be true, if the seed is alike equally ripened. Preternatural growths, and thin, lean, shrivelled seed may produce all the disorders to which plants and seeds are liable.

The ustilago or burnt grains, are, as far as I have been able to trace them, I think, completely contagious. I tried a great many plants of wheat, barley, and oats, in various fields through two or therefore, there is no doubt but this disease will spread far and wide, and much injure the crop, more or less as the season is calm or boisterous.

To purify, therefore, such seed grain, the lye should be made strong and applied hot; the seed during its steeping ought to be very much shaken about with brooms, the foul water frequently let off, clean water put in, and all the light grain constantly skimmed off.

Rubigo mildew, is a disease evidently brought on the corn, by the effects of very sudden changes in the weather, as during a very hot sun and a still air the atmosphere is suddenly over charged and obscured with fog or mist; or when, after a hot day and night, the sun in the succeeding day has not been sufficiently clear and bright, to dispel the quantity of vapours or exhalations which have arisen, in consequence of the extraordinary discharge of perspiration from vegetation, occasioned by the increased heat; and it is equally brought on by extreme cold suddenly checking the perspirable matter which should be discharged from the plant to keep it in a state of health and vigour. It is brought on also by a continued drought, especially in hot burning sands, or shallow soils that run together.

Every gardener of experience knows the sort of weather that will produce the mildew and blights; he can, by immediate attention, prevent any serious consequence to his crops by blights, because they are always accompanied by insects; but I know of none for the mildew, although many expedients have been tried. The straw becomes spotted very thick with black or grey spots, and the whole appearance, instead of being yellow of various hues, looks mouldy, with a strong smell, and the corn is lean and shrivelled.

Abortio: abortive grains are very common, and appear to be a disease neither confined to particular soils, situations, seasons, or sort of wheat, but originating probably from a check produced at the root; because those plants when taken up are always covered there with certain concretions, which, when applied to the nose, smell exactly like the spawn of fungi. The plants very early shew symptoms of the disease, by the leaves and stalks turning yellow, and being curled as if inclosing a small grub; as the disease increases the colour of the leaves changes to a light blue,* they retain their indented shape, become more limp, and hang loose, as if in a decaying state; it is seldom so severe as to kill the plants; on the contrary, many of them continue nules full of thick fetid juice. In other plants, the whole contents of the ear within the spathæ are black kernels, connected together by fine threads drawn inwards, as if done by insects, (which are said to be the anguillæ of Linnæus.)

I have endeavoured to communicate this disease by strewing the ears of healthy corn when in flower with the powder, and by making incisions in various parts of the plant, squeezing the juice of the infected plant into it, as well as by putting some of the dust into those incisions, but without producing any effect; as the corn was neither that year nor the succeeding one at all injured by it. Some farmers have thought that the disease was produced by insects. I confess I am not inclined to think so, because, in the first place, I have always found the root affected sooner or later in the manner before mentioned; secondly, because I never could discover any punctures, either about the joints or in the spathæ of the plant, or the least motion in the dust by which animalculæ could be traced; thirdly, because if there were any punctures, they were not discoverable through a magnifying glass, or a very good microscope; nor could I discover any liquid matter to be extravasated from any particular parts at any particular period during the growth of the plant; but I have always found a peculiar sort of black dust pervading the stem: and fourthly, because the juices of the plant were, in every part of it, of a yellow rather than a green cast, which latter is the colour of plants in perfect health. From all which circumstances, I am inclined to think that the disease is produced from something inimical in the weather, which produces a stagnation in the juices of the plant, and it becomes a fit subject for the seeds of parasitical plants to be lodged on, as they float in the lower atmosphere.*

There is still another disease called the blight, which from its great similarity to the last, or abortive grains, I did not think of a sufficiently distinct character, or to prevail so generally, as to be considered a species; in fact, I consider it as a very partial circumstance.

It is not often that either this county, or any other in the kingdom, is visited with it; but when it does happen, it causes a great deficiency in the crop.

The most severe period that I remember was in the year 1795, when the crop, on the better and middling soils, had looked sufficiently promising to deceive many a good judge; but on the thinner soils it was generally observed to be defective, which, with the shortness of the stock in hand, coming to the ears of the then indefatigable President of the Board of Agriculture, Sir John Sinclair, he very promptly caused an examination thereof to take place throughout, I believe, the united kingdom; and my father having been selected to perform that office in Surrey, a great part of the inquiry fell to my lot, which, as it will explain the effects of the disease, and point out some circumstances not very generally known, I shall transcribe from my notes for the information of my readers.

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* Since the above was prepared for the press, and had been read in the summer of 1804 by many gentlemen occupying their

The appearance of the wheat while it was standing, was, in good soils, and in a state of high cultivation, sufficiently abundant; but in light shallow soils, in sandy soils, or in very stiff ones, especially in the common fields, it was not likely to be productive.

From one field of 13 acres, from which a sample of the corn in the ear was taken to the board, it yielded, when made up, full four quarters to the acre; and the produce sold at Croydon market on the 3d of October 1795, for £.20 10*s*. per load. Handsome as was this produce, there were nevertheless some defective or blighted ears.

The samples from the light or shallow land were leaner generally, the ears defective at the point, and would not average more than 2½ quarters to the acre; some of these were sold at Croydon market at £.16 per load.

The samples from the calcareous, or very stiff soils, exhibited a fairish external appearance upon all sides, but upon close examination they turned out generally more or less defective on the south or south west sides of the ear, and would not average more than 18 bushels to the acre. The grain was better filled than was expected; and sold at Reigate at £17. 15*s.* per load.

The samples from poor thin soils, or very cold wet ones, produced a small thin grain, the ear short, the straw very weak, and the plants thin on the ground, the average was calculated at 15 bushels to the acre, and sold at Kingston for £14. 10*s.* per load.

The samples from the sandy soils contained ears with small kernels with very little flour in them, the straw much mildewed, and ran from 12 to 16 bushels to the acre; some of which sold at

The winter was sharp and intermitting, which heaved up the soil; and when it subsided, many of the plants were left exposed, and the roots became subject to all the changes of the weather. The spring was favourable, but backward; the wheat that was then sown had not sufficient hold of the ground in land that was either not naturally good, or made rich and forcing by good dressing and deep ploughing before the hot weather made it spindle; and dry weather continuing for some time, the land became exhausted of its moisture and nutritive particles for the support of the crop.

If we revert to the season I am alluding to, we shall find the following circumstances nearly descriptive of it. The month of April was cold and piercing; that of May produced some sharp frosts at night, with an unusual hot sun a little after mid-day. The month of June was favourable upon the whole, although there were some occasional hard frosts and partial rains; however, the autumn sown wheat, in land of good cultivation, was found to grow very fast, and by the end of the month, the spike was unsheathed, and looked bold and well; the late sown, and spring sown, was getting on as fast as might be expected, but it wanted that vigour in the stem, and dark green in its leaves to denote a genial growth, and it was much more backward than the autumn sown wheat. The month of July set in favourably, about the middle it was cold, attended with sharp rains, hail, and not a little lightning. The harvest was backward, long, and tedious, from the unequal ripening of the corn, although the time was as favourable as could be wished.

Notwithstanding the price at the opening of the markets for the new wheats was sufficiently high to have induced the farmers to bring their corn to market with alacrity, yet so little came (and, as I have said before, the old stock in hand was comparatively so small) as to induce the board to submit the following queries to us:

1. What is likely to be the extent of the yielding of the present crop?

2. What is the quality of the grain?

3. What is your opinion of the proportion of seed wheat for this year?

4. Assign the reasons why in your opinion so small a quantity has yet been brought to market.

5. Whether you think that much greater quantities will be brought to market after the seed time is over?

6. Whether you can form any conjecture of

may be conceived, it is then so tender as not to be able to bear this sudden impetus of cold, preceded by wet: even a dry frost would injure it, but certainly not so materially. This injury then affecting the part that is uncovered, will account for the reason why the top should be affected, and not the rest of the spike, and it may have taken such deep hold as to prevent the grain at the point from becoming perfect. Any sudden check in the progress of vegetation, whether proceeding from the soil, or from any other cause, whilst the grain is forming, will most certainly produce a blighted or disordered ear.

Or, if when the corn is in blossom, and the farina just ready to scatter, much cold driving rain should happen, one side of the ear may have all the farina washed away, or otherwise injured, while the other side may be only partially so, or perhaps not at all, and especially if the straw is strong, and stands bold upon the ground; the clevels on that side will therefore be very deficient.

Or, if when the air has been suddenly overcharged with heat, it collects a superabundant portion of vapours, which are dispelled by a thunder storm accompanied by much lightning, with the wind at East or E.S.E. The effects of this electric fluid will effectually blight such corn as may be in the ear, especially if it should happen during the period of its impregnation. In fact, any sort of tempestuous weather, by being supercharged with nitrous or sulphurous particles, will inevitably injure the corn in the state alluded to.

The French call this disease blès coulès; and I should name it sidero, which signifies to blast with lightning or wind, &c.

With respect to the other queries, they are not of importance now, since the period is gone by that called for them.

The close of the last century, viz. 1799, was altogether the most scarce year that had been known during perhaps the memory of the oldest man; but this alarming scarcity which was so severely felt by all ranks of people throughout the United Kingdom, was not the effect of disease, but proceeded from the uncommon unfavourableness of the seed time, both in autumn and in spring; by which a great deal of land was not sown, and the greatest part of that which was sown was so badly got in, that much of it was perished, or the plants became otherwise so materially injured, as not to be able to recover them-progress as insects. We have none I believe, in this county peculiar to it, that at present need give us any alarm; but being close to the metropolis, and many of our farmers being men of spirit and enterprise, perhaps the following narrative, as it may be new to many of them, will put them on on their guard, as to the introduction of wheats, the produce of those places where the insects, which form the leading feature of this account, prevail.

Of late years the importation of wheat from the continent of America, and from every part of Europe, has increased to an alarming extent, and must prove beyond all dispute either that the number of the inhabitants of this country have increased in a degree beyond all former precedent, that the annual growth is very inadequate to the increased demand, or that the extravagant mode of living which prevails through every class of the community, added to the enormous waste which is known to accompany a state of war, creates a consumption of wheat greater than ever was known in the annals of our history. The greater, therefore, our importation, the greater will be our risk of introducing insects and animalculæ into the granaries, and perhaps the fields of this country.

In the years 1787 and 1788, the greater part of the southern provinces of America were infected with an insect or insects called the Hessian fly or flying wevil, the dreadful ravages of which naturally alarmed the administration of this country from the accounts which were from time to time transmitted to them from their consul at New York, and especially as they were given to understand that not less than 50,000 quarters of wheat had been imported, and were expected to arrive in different parts of this kingdom between Christmas and July 1788, among which it was reasonable to expect that more or less of this infected corn might compose some part of those several cargos.

This extraordinary insect, the flying wevil, appears, from a letter from Sir Joseph Banks to the Marquis of Carmarthen, to have been observed in the southern provinces of America about 50 years before, which reckoning to the present period will make it about 65 years, and since that time has regularly extended itself to the northward without quitting any place where it has once got possession.

The animal when complete is a minute moth, somewhat resembling that which breeds in and destroys woollen cloths. Its eggs are laid upon reaping, the principal mischief done in the rick, and that the intense cold of the climate, though it destroys some of the caterpillars, and renders the rest torpid, does not prevent them from reviving when heat returns, and furnishing a plentiful supply of moths ready to lay their eggs at the time of the ensuing harvest.

The flying wevil was known in America many years back, and had made great ravages in different parts of that country for some years. The danger to be apprehended from the importation of any corn infected with the flying wevil is much greater than from that which has been infected with the Hessian fly; the former always attacking the grain and there depositing its eggs, the latter confining its ravages to the blade of the corn, and not touching the grain.

Sir Joseph Banks is of opinion that the fly which made such havock in the southern provinces of France, and which appeared at or about the same time in America, is one and the same species of fly, or at least very similar in their operations.

It is easy to discover by simple inspection whether or not corn has been infected by the flying wevil; the holes in the grains through which the moths have issued are very evident; and as the progress of the insect is rapid, especially in warm weather, no damage is to be feared from corn of the last harvest, unless the animal has been preserved in it by passing through various generations, the traces of which must remain.

The business, however, will be much abridged by throwing the corn into water. If the whole quantity sinks readily to the bottom, it may be safely judged free from insects; for in the infected corn, a large proportion of that which either does contain, or formerly has been occupied by, the worm, will swim on the top.

Those grains which swim should be carefully inspected, by breaking them gently with the point of a knife in the direction of the slit, and examining the contents. In some will be found the husk of a chrysalis of a light brown colour, out of which the moth has proceeded: in others, the worm, in various periods of its growth; and some will be found empty of every thing except the excrements which the insect has left behind. In all the samples that have been examined here, the worm appears to have been long dead. If any cargo of living ones should be discovered, that circumstance must be scrupulously noted, and information of it instantly communicated.

had introduced it; but it is more probable that it is a native animal, nourished by some indigenous plant, but which then, for the first time, came among the wheat, and found its proper food.

It is an insect of the fly tribe, which passes through several metamorphoses. Dr. Mitchel has seen the caterpillar, chrysalis, and fly, but never could find the egg, or discover where it is deposited.

The first appearance of the caterpiller is in autumn, soon after the wheat has risen above ground, when it voraciously devours the tender stalk of the delicate plant, and soon becomes a chrysalis, coloured like a flax seed, which being fixed between the leaf and the stalk, injures the plant by mechanical pressure; from this a fly proceeds, either able itself to endure the severe frost of winter, or laying eggs endowed with the power of sustaining it.

Early in the spring the caterpiller appears again, while the heat is scarcely sufficient to make the wheat grow. Its ravages, therefore, are at this period particularly destructive, and it passes through its different metamorphoses with such speed as to produce a third generation, while the wheat is still tender and juicy; however, as it has by this time grown considerably, the third generation is not so destructive as the second. It hurts chiefly by rendering the straw weak, and liable to break down, when loaded afterwards by the weight of a full ear; and sometimes, says Dr. Mitchel, (though he does not explain how) it will be infected by the fourth swarm before harvest.

It attacks white and bearded wheat equally, and has damaged rye and Timothy grass; its mischief is entirely confined to the green herb, while that of the flying wevil is in like manner limited to the grain.

Government, having acquired the preceding particulars, were desirous of pursuing the inquiry still further, they therefore proposed the following queries in order to enable them to judge of the propriety of admitting those cargoes of wheat that where then expected from America.

FLYING WEVIL.

What are the northernmost parts in which, at present, the flying wevil is observed to damage the wheat?

Has its progress towards the north (which we know to have proceeded gradually and regularly from Carolina to the countries of Delaware and

HESSIAN FLY.

Does such an insect exist in Hesse or any part of Germany? The Americans, who believe it was brought from thence, countenance, by so doing, the possibility of its being transported across the Atlantic; and its first appearance having been made on an island, gives further weight to that suspicion.

What is the space of countries over which this insect has now spread itself? In what manner, and at what rate does it travel?

Where, and in what manner, is its egg deposited? Hitherto it is the opinion of many in America, that it is lodged on the grain, and, from the experiment which has been tried, there is great reason to believe the truth of that assertion, which implies the utmost danger to those who receive it.

On the question, whether or not the wheat of the last harvest, now imported, or soon to be expected, from America, be admitted to entry? It may be useful to premise a few words.

If it is infected by the flying wevil, that animal must, since the last harvest, have passed through many generations, and consequently have destroyed a considerable proportion of the cargo; in cases, therefore, where much spoiled corn is found, a careful inspection of the light grains will be necessary, and such an inspection cannot fail to detect the animal, in whatever state it may be, if alive.

If the Hessian fly has laid its eggs on the grains of corn; from the analogy of other insects, we have every reason to think that the energy of nature, which enables them to support the frost of the winter, gives them also the property of hatching on the first return of the warmth of spring; they must therefore long ago have been hatched, and the caterpillars from want of their proper food, the green leaves and stalks of wheat, by this time have totally perished with hunger.

Upon the arrival of the several cargoes they were severally and minutely examined, and from the reports that were made by the officers and persons appointed to inspect them to the privy council, the lords of the treasury permitted them to be entered.

Sir Joseph Banks in compliance with the commands of the lords of the treasury furnished them with another report respecting these insects in the following words:

proper food is ready, will generally survive even weeks before it perishes for want of nourishment, and in some few instances, when it is naturally hatched in the autumn, it is directed by instinct to spin a web in which it remains torpid, and without food, during the whole continuance of winter.

The chrysalis is endowed with a variety of powers, and consequently though deprived of locomotion, is capable of resisting various dangers, arising from heat, cold, wet, &c. and the length of time which the animal remains in this state is capable of very considerable extension.

The complete animal, tender as it appears, and intended to exist no longer than is necessary to fulfil the business of propagation, which in some species is gone through in a few days, is nevertheless capable in some instances of enduring the utmost variation of climate, and if by accidental circumstances the sexes are prevented from meeting, its short life is extended to many times the amount of its usual duration; a circumstance as curious perhaps, as any that has been observed in the history of animated nature."

Having premised these general observations, he proceeds to treat of the insects separately, beginning with the flying wevil; for an account of which he refers to his former specification. From that account, corrected in some instances by better information procured since it was written, it appears, that the flying wevil first attacks the corn in the field, when it is nearly ripe; that it there lays its eggs on the grain, while in the ear; that these eggs, or the caterpillars they produce, are consequently carried with the corn into the rick, where they pass through all their states, and lay eggs again, till stopped by the frost; that in the next spring the insects appear again; and if the corn remains in the rick, their progress cannot be stopped while a single grain remains undevoured.

The precautions used by the inhabitants are as follows:

If the corn is moderately affected, they stack it in a barn, having a space between the sides of the mow and the walls, which space they fill up with hay or chopped straw, trod down hard, in order to keep out the air, and they cover the whole in the same manner, and with the same materials; this they say checks the progress of the insect, but they do not pretend that it destroys it.

If it is much infected they leave all other work, as that method, besides its expence, renders it unfit for vegetation, and less proper for some domestic uses, it is very rarely practised.

Some other precautions are proposed, especially by Jefferson in his state of Virginia; but not one, either intended or executed, is hitherto asserted to be more than a palliative, attempting the destruction of the larger part, but never supposed capable of radically destroying the whole brood.

On the possibility of the animals being brought over in cargoes of wheat, which may so easily be deduced from the foregoing observations, the following remarks have been made.

That nineteen years experience, for in so many years since the fly was first observed wheat has been imported here from the countries infected with it, is a sufficient experience to prove that it cannot be brought, or if it can, that it is incapable of being propagated here.

That the insects, in whatever state of metamorphosis they have been found in the cargoes hitherto examined, were universally dead.

That the climate here is not hot enough for their propagation and consequent increase.

To these it may be answered, that although a certain degree of probability may be deduced from these circumstances, they do not on the whole amount to that degree of certainty, which in a matter of such material importance ought to be required. Stowage in deep bulk, as is done in a ship's hold, will destroy a great number of the insects, consequently the risk upon each cargo that has already been imported is greatly diminished; and the aggregate risk that has been run by admitting so many, is a much less powerful argument than it seems to be. The dead animals will naturally be far more numerous than the living ones, and consequently more easily found; indeed, it is more than possible that some of the living ones may remain unobserved in ships and warehouses, under the form of moths, in which state they may easily escape even a diligent search.

The progress the flies have hitherto made to the northward, and in the hotter climates, up the higher mountains, furnishes a powerful argument, from which it appears that by degrees they inure themselves, in passing through successive generations, to colder and colder climates. The time may not yet be arrived, when they will be hardened sufficiently to endure the climate of England; but it may within a few years arrive, and in that case, boasting of security derived from experience, That no one has been able with certainty, to discover where, or in what manner it deposits its eggs.

That its eggs hatch in the beginning of spring, when the heat is scarcely sufficient to make the wheat grow, and that its powers of destruction are so great, as to threaten a total abolition of the culture of wheat in the lands of which it has got possession.

From an experiment referred to by Mr. Bond, it appears, that he believes the eggs to be laid on the grain; from general analogy it is more probable that they are deposited on the straw, and being shaken off from thence by the strokes of the flail in threshing, are mixed with the corn, from whence it may be, and probably is, very difficult to separate them.

Hence an apparent and very considerable risk of importing the insect, with every cargo that arrives, is manifest, and from the degree of cold in which the eggs are hatched, nearly a certainty may be deduced, that if brought here, and once fixed among a crop of wheat, it will establish itself in this climate.

In objection to this it is urged, that as wheat in that country will not bear to be shipped till after having been exposed to severe frost; no cargo can arrive till the month of January, and that the wheat seed time being then over, there is no danger of its being used as seed corn.

And again, that it spreads regularly at the rate of seven miles a year, which proves that it is extended merely by the operations of the fly, and not by the means of seed corn.

To both these the reply is evident, that as much spring wheat is grown in America, and the seed time of that grain here is not over till April, or even May; there is the utmost danger, if it is fair corn, of its being used for seed; and that if any people chose to be such rogues as to sell, none would be such fools as to buy seed corn, ever suspected to be the seat of such a calamity, where every one is aware of the circumstance.

From these premises, and the general observations upon the natural history of insects, I think myself justified in forming, what I here state to be my opinion on the subject.

That as long as corn is permitted to be imported from places, in which it is infected with the flying wevil or the Hessian fly, we are in danger of one or both of those insects being brought with it alive, and propagated among our corn; and I have stated country as long as wheat continues to be cultivated.

The ravages of the plague are confined to the extinction of a certain proportion of the human species, which may be, and generally is replaced in the next generation; and those of the murrain to the abstraction of a certain portion of food, which, however, is of a kind principally expended in the maintenance of the affluent and idle.

Those of the insects, as they diminish the actual quantity of bread corn, extend themselves to a real diminution of population, and consequently of productive labour, from whence every resource of government must ultimately be derived.

In America, where the country is chiefly peopled with cultivators, it is of less consequence than it would be here; they can easily raise corn enough for their own subsistence, and that of the few unproductive hands among them, even though a large part of their crop is subtracted.

But in England, where increase of population and improvement of husbandry have gone hand in hand for several years, and where population has rather the start, as is proved by the importation of bread corn, let us take a view of the consequences of the abstraction, of even a small part of the produce of tillage.

Every man who tills the earth, may be supposed to raise corn enough for the maintenance of ten people besides himself, and these may be supposed to consist of six manufacturers, and four of the affluent, their unproductive dependants, or the army.

If then, by the introduction of any species of calamity whatever, the mass of labour now employed was to produce one sixth part only less than it now does of food, the consequence must be, that as neither the affluent nor their dependants would eat an ounce less than usual, or consume less of the manufacture of home consumption, one sixth part of the manufacturers, all of the class that work for exportation, must cease to eat, and consequently to labour, or receive their food from abroad; in which case, instead of being the sources of that productive labour, upon the returns of which all taxes are levied, they would become brokers for the turning the corn of other nations into manufacture, for the benefit of those who grew it; for it must be allowed, that in whatever shape manufacture is carried to market, food, and food only, is its creator, and that the whole of the honest gain it produces, must ultimately center in the kingdom, to examine with the greatest circumspection every cargo of wheat that should arrive, and to report the state thereof to their lordships, and a cargo having arrived at Bristol, the collector and comptroller of the customs there examined the said cargo, and reported the result of their examination to their lordships, who forwarded the same to Sir Joseph Banks, who returned the following answer.

"As it is evident from the report of the officers of the port of Bristol, that the cargo of the Coalition, John Atkinson, Master, from Virginia, contains numbers of the flying wevil of that country, in a dead or torpid state, and as it is in my opinion impossible to ascertain with certainty whether some of them may not revive, on being again exposed to the air, I am of opinion, that the said cargo should not on any account be admitted to entry."

Colonel Morgan in a letter to Sir John Temple, respecting the Hessian fly, after giving a history of this insect, agreeable to the account which I have already detailed, proceeds thus, from this history of the fly, and its progress, you will perceive that Britain can run no risk of importing it in cargoes of wheat, as it has no connection immediately with the grain, and its egg or aurelia, can only be transported in straw or litter, or designedly, by care and attention to do it; but were a single straw containing this insect in the egg or aurelia, to be carried and safely deposited in the centre of Norfolk, in England, it would multiply in a few years so as to destroy all the wheat and barley crops of the whole kingdom. There cannot exist so atrocious a villain as to commit such an act intentionally. It has extended itself to the neighbourhood of Philadelphia, 80 miles westerly; to Northampton, 100 miles north westward; to all the wheat countries of Connecticut, and to Saratoga 200 miles northward, over great rivers, bays, and mountains, so that were it once to reach Britain, it would become the greatest scourge that island ever experienced, as it multiplies from heat and moisture, and the most intense frosts have no effect on the egg or aurelia.

From the pains which he has taken to inform himself of its manners and life, and from the several experiments which he has made to oppose its destructive depredations, it appears that good culture of strong soils, or well manured lands, may sometimes produce a crop of wheat or barley, when that sowed on poor or middling soil, without the other advantages will be totally destroyed. But as the insect lives in its aurelia state in straw and stroy the flying wevil; I cannot learn that the Hessian fly is at all known in this country.

Method of destroying the flying Wevil in Bavaria.

The author of this information having greatly suffered for many years by the wevils, and having tried every possible means to get rid of them, made use at last of a plant, the smell of which attracted these insects from their habitations. He put on a heap of corn, thyme and sweet marjoram, and changed each of these plants every four and twenty hours, in hopes of discovering one which would answer his purpose. He tried also hemp, took a handful of it, and put it on a heap of corn, and found the next morning that the hemp was full of wevils. These little black insects seem to have a smell of a curious nature, since they find the bad smell of the hemp agreeable, and it appears they like the soft rind of it. This handful of hemp was picked, taken out of the granary, and winnowed, and put again on the corn; the result was, that in five days afterwards there were no wevils to be seen in the said heap of corn.

The same experiment was tried by people in the neighbourhood, who can confirm the same thing. In the season where there was no green hemp, they made use of mouldy and old hemp, and the success was equal, except that it required a longer time to destroy these insects. When the wevils appeared again, in the month of May the following year, in less quantities, and at that period there was only the tow or heards of hemp that was already prepared to spin; nevertheless, the success was the same in eight days time, and all the wevils removed. Perhaps linen might be used, steeped in the juice of hemp, where the hemp is not cultivated, and the effect might turn out equally successful. However, it is necessary to shake the hemp well that is put on the corn, and to stir the corn if it is in great quantities, in order to bring the wevils to the surface. This experiment was also made in a rainy summer, when it was necessary to collect together the sheafs which were very wet, and to carry them to the granary, which of course produced a great fermentation in the barn as well as in the granary, and from that cause produced many wevils. Hemp was made use of very early in the spring, and the corn stirred at the same time, and as the excessive heat arose from it the wevils disappeared.

Mr. Bond having been the first to inform our government of the depredations committed by these

" This is certainly not the fly wevil described by Carter, in the first volume of the Am. Philos. Transactions. Since the fly wevil was never known to advance from the southward into Pennsylyania, and I am convinced, from the best information, it never did; though it extended gradually from Carolina into Virginia, Maryland, and the Delaware state, the course of its progress was very different from that pursued by the Hessian fly. Long island was indisputably the point of departure of the Hessian fly; and indeed, my lord, it is not very probable, or consistent with the natural order of things, that an insect of this sort should have traversed such an extent of distance, as the space between the Delaware state and Long island, without marking the intermediate country with some of its ravages. But, my lord, there is a very essential difference as to the form, colour, and appearance of the one and the other: The Hessian fly is a small, dark fly, with thin, long, black, legs; clear transparent wings, extending far beyond the body, or the trunk; with small though perceptible horns or feelers projecting from the snout. Those I have seen appear, in size and shape, like a little fly which attacks cheese in this country, (America,) and which is very closely watched by the keepers of dairies here, as very productive of the worm or skippers, which destroy cheese. And, my lord, it is very remarkable that the worm produced from the egg of the Hessian fly of which I have seen numbers, though rather thinner and longer, bears a strong resemblance to the worm in cheese. The fly wevil, as described by Carter, is a pale brownish moth, with little trunks or bodies shorter than their wings.

The horns which evidently appear on the Hessian fly, may be provided by nature as feelers to enable them to perforate hard grain, as well as grain in a softer state; though, my lord, I have not seen any person who has perceived the egg worm or fly in the grain of the wheat, or who has found any nit, mucus, or even dust, in the dry straw, in ricks or barns, to induce a belief that the egg is there deposited after the harvest.

"One of the publications which I now inclose to your lordship, goes so far as to favour the idea, that the fly even perforates the seed, and deposits its eggs therein.

"The publication I allude to, is that signed 'A Landholder,' whose ideas have been condemned as tending to mislead others, but by no means confuted either by reason or experiment. An observation I made myself gave me some cause to apprehend the idea mentioned in the paper signed carries some strength of suspicion, that the fly may deposit its eggs in the mow; for it is plain from Cleaver's observation, that the flies died in great numbers about the time the grain in his garden was affected; and all the flies thrown from Potts's rick were either dead or torpid. Still, my lord, the essential test by which the extension of this mischief to distant countries is to be attributed and decided, is wanting; as no sort of discovery was there made, by either of the persons above-named, that the egg was actually deposited, either in the straw or in the grain, in their mows. The fly first appeared in the county of Chester, in this state, after a powerful N.E. wind had prevailed for several days; previous to which it had not been observed in that country, or within 17 or 18 miles of the places where it has been discovered: this wind was most likely the means of introducing the fly into that district of country, and its violence and continuance expedited and extended the approach and progress of this insect.

" Some with whom I have conversed, my lord, infer that the seed is not infected by the fly; because, the first growth of the wheat is strong and wholesome, which, they say, would not be the case, if the seed had been injured or impoverished by the insect before it was sown. But, my lord, this mode of reasoning by no means of itself carries conclusiveness with me; it does not follow, that, because some of the seed grain might be only partially injured, that the grains partially hurt may not sprout in the field to some degree of strength, and the grains which have escaped totally may not yield a full and ample produce; in short, it does not follow, that every grain is to be affected by the fly; or that every grain which is affected, is thereby deprived of all its vegetative quality. The peas of this country are subject to a very ruinous worm. Many of the seed peas, though worm-eaten, spring from the earth in appearance healthy and vigorous; but these fail essentially in productiveness.

"It may be perfectly true, that neither the egg, worm, or fly, has been found deposited in the grain; but the works of nature are so minute, and its modes so inscrutable, as to baffle every endeavour hitherto made to form a satisfactory conclusion, or even to inspire a reasonable conjecture on the subject; indeed, my lord, the means of attaining a thorough knowledge are not common here; few are possessed of microscopes, or suitable instruments, to assist in making the necessary discoveries; nor have I yet been able to procure any thing of the history given by the Americans, of the origin of the Hessian fly, which they assert with great earnestness was brought hither in the straw beds and baggage of the German troops employed in the late war. Through the medium of straw, it is by no means impossible the egg or the worm may be transported; and any number of the insects conveyed to England, however small, would soon, by their rapid increase, spread this alarming evil. The warmth of a ship's hold would be very favourable, not only to their being preserved, but vivified.

" It is too certain, my Lord, to admit of the least doubt, that in the countries upon this Continent where this insect has appeared, loss and destruction have followed; in some instances the farmers have been reduced to thin and wretched crops; in other instances the ravages have been so extensive, as to make it necessary to plough up the field, and to change the nature of the tillage. The yellow bearded wheat, it is thought, has, and will resist the attacks of the fly, and is now generally used in seeding at this season, where it can be procured."

Letter from Mr. Christopher Gullet to Dr. Matty, on the effects of elder, in preserving growing plants from insects and flies.

" Sir,

" I should not presume to trouble you with this letter, did not the subject seem to promise to be of great public utility. It relates to the effects of elder.

1st. In preserving cabbage plants from being eaten or damaged by caterpillars.

2d. In preventing blights and their effects on fruit, and other trees.

3d. In the preservation of crops of wheat from the yellows, and destructive insects.

4th. Also in saving crops of turnips from the fly, &c.

1. I was led to my experiments, by considering how disagreeable and offensive to our olfactory nerves the effluvia emitted by a bush of green elder leaves are, and from thence reasoning how much more so they must be to those of a butterfly, whom I considered to be as much superior to us in delicacy as inferior in size; accordingly I took some twigs of young elder, and with them whipped the cabbage plants well, but not so as to hurt them, just as the butterflies first appeared; from which time, for these two summers, though the butterflies would hover and flutter round them, like gnomes

much too late, as it should have been done once or twice before the blossom appeared; but I conclude from the whole, that if an infusion of elder was made in a tub of water, so that the water might be strongly impregnated therewith, and then sprinkled over the tree by a hand engine, once every week or fortnight; it would effectually answer every purpose that would be wished, without any possible risk of hurting the blossoms or fruit.

3. What the farmers call the yellows in wheat, and which they consider as a kind of mildew, is in fact occasioned by a small yellow fly, with blue wings, about the size of a gnat. This blows in the ear of the corn, and produces a worm almost invisible to the naked eye; but being seen through a microscope, it appears a large yellow maggot, of the colour and gloss of amber, and is so prolific, that I last week distinctly counted 41 living yellow maggots or insects in the husk of one single grain of wheat; a number sufficient to eat up and destroy the corn in the whole ear. I intended to have tried the experiment sooner, but the dry, hot, weather bringing on the corn faster than it was expected, it was got, and getting into fine blossoms, ere I had an opportunity of ordering as I did; but, however, the next morning at day break, two servants took two bushes of elder, and went on each side of the ridge from end to end, and so back again, drawing the elder over the ears of wheat, of such fields as were not too far advanced in blossoming: I conceived that the disagreeable effluvia of the elder, would effectually prevent those flies from pitching their tents in so noxious a situation; nor was I disappointed, for I am firmly persuaded,

that no flies pitched or blowed on the wheat after it had been so struck; but I had the mortification of observing the flies the evening before it was struck, already on the corn, (six, seven, or eight, on a single ear,) so that what damage hath accrued, was done before the operation took place; for on examining it last week, I found the wheat which had been struck, pretty free of the yellows, very much more so than what was not struck: I have, therefore, no doubt, but that had the operation been performed sooner, the corn would have remained totally clear and untouched; if so, simple as the process is, I flatter myself it bids fair to preserve fine crops of wheat from destruction, as the small insects are the crops' greatest enemy. One of those yellow flies laid at least eight or ten eggs, of an oblong shape on my thumb, only while carrying by the wing across three or four ridges, as apfested with cockchafers or oakwebs, that in many parishes they eat up every green thing but elder, nor left a green leaf untouched, except elder bushes, which alone remained green and unhurt, amid the general devastation of so voracious a multitude; on reflecting on these circumstances, a thought suggested itself to me, whether an elder, now esteemed noxious and offensive, may not at a future day be seen planted with, and entwisting its branches among fruit trees in order to preserve the fruit from destruction by insects, and whether the same means which produced these several effects may not be extended to a greater variety of other cases, in the preservation of the vegetable kingdom.

The dwarf elder (sambucus ebulus) I apprehend emits a more offensive effluvia than common elder, therefore must be preferable to it in the several experiments.

N. B. As the Hessian fly deposits its eggs in October or May, when the wheat is small, perhaps the best method would be to make a strong infusion of elder water, and sprinkle it over the ridges with a water pot, (having a fine rose to it.) Quere, whether the weed called the pokeweed, (phytolacca Virginica,) and another called henbane (hyoscyamus niger,) do not possess qualities as noxious to insects, and may not be used with as great prospect of success as elder.

Steeping the seed in a strong decoction, or even in the simple infusion of elder made strong for 12 hours, has been found to succeed in many cases."

In Pennsylvania the manner in which the fly is found to operate is thus: it passes between the outer straw or husk, and the stalk of the wheat, until it reaches near the first or lower joint, and there, somewhat like a caterpillar on a twig, fixes its eggs on a stalk, in number from six or eight to fifty; by the growing of them the stalk becomes so compressed with the adhesion of the cluster, and weakened to such a degree as not to support its own weight, consequently falls to the ground, and the crop is irremediably lost.

The most enlightened farmers in that province are of opinion, that it appears unlikely that any means within the bounds of human wisdom will be found to destroy it, or to tincture the wheat stalks with any noxious quality, sufficient to prevent the fly from preferring the common wheat stalks to deposit their eggs for the continuance of their species.

The Marquis of Caermarthen having applied to Lord Viscount Torrington, our minister at and every other insect and species of vermin that attack corn.

I have reason to believe that the methods used by the Flemish farmers against the wevil, and other insects that devour grain, are confined to often stirring and airing the heaps, and more especially to frequently passing them upon the sieve or wire screen, and taking out of them every species or appearance of filth and vermin. I know there are secrets and pretended receipts without end to destroy vermin in corn, but I am persuaded that a constant attention to fresh air and cleanliness are the only effectual ones that are within the reach of every common farmer; and it is his fault and loss if he does not make use of those.

The names of flying wevil and Hessian fly, can give no information, since all the species of wevils, being of the class of Scarabées, have wings concealed under a scaly cover, and can use them in climates and seasons sufficiently hot. Their respective methods of feeding being common to a great number of species of this insect, it remains that the descriptions alone can make them sufficiently known, and distinguish them specifically.

In a letter from Mr. Heathcote to the Marquis of Caermarthen, he gives an account of an insect that exists in Germany, in the following words. Dated Bonn, Feb. 16, 1789.

"An insect much like that called the flying wevil exists indeed in some parts of Germany, particularly in Franconia, and in Swabia, towards the frontiers of Switzerland, about the lake of Constance; but happily for those parts, it does not swarm in so great quantities, nor has it been found hitherto so destructive, as that existing in America; several intelligent farmers have made the following observations on these insects:

"They couple in the spring, and lay their eggs in the grains; the caterpillars appear very soon after, begin by eating up the grain in which their eggs had been laid, they afterwards spin a kind of thread, by the means of which they pass from one grain to the other, and continue eating them during the summer; but when the nights begin to grow colder they retire from the stalks, and creep between the cracks or chinks of the granaries or barns, where they lay torpid during the whole winter. They are particularly attracted by the grains being heaped up in the granaries at a time when they are not yet entirely ripe, or not sufficiently dried; according to the English farmers' the grains thus exposed must be turned up very often.

"The best and surest method, however, founded upon long experience is, to have the ground floor of the granary well cleaned, and every joint choaked with lime and stuck, (by which I suppose is meant a sort of plaster) by which the winter retreats of the insects will be shut up; besides that the floor must be carefully washed with hot water, in which a sufficient quantity of salt has been dissolved, it will at the same time be very useful to continue, if the place and circumstances permit it, to make openings in the granary, by which a continual and strong draught of air may be procured on all sides."

The following Memoire is a translated Copy of an Extract from the Register of the late Royal Society of Agriculture at Paris, presented to the Duke of Dorset by Mons. Broussonet, 28th Aug. 1788.

The grain of North America has been destroyed for many years past by two species of caterpillars, whose ravages have become alarming, and the entry of corn, the produce of that continent, has been refused in England. The Duke of Dorset, his Britannic Majesty's ambassador extraordinary, having applied to the Royal Society to know whether the same insects actually exist in France, in what province they have appeared, what extent of country they occupy, and by what means they propagate themselves, the society has charged us to make our report upon each of these objects, in order that they may be laid before the said ambassador.

Two Memoires from the Duke of Dorset, contain the Particulars respecting these Caterpillars.

The insect marked No. 2, does not attack the corn as well as the plant, it begins its havock in the autumn, as soon as the seed has vegetated and the plant has acquired a few leaves; it appears again in Spring and passes through several metamorphoses before the corn has acquired strength enough to resist it. This insect, whose devastations had not been particularly noticed before the year 1776, does not appear, as far as we can judge from so short a description, to differ from those which have been observed in the north, and whose history is contained in the different publications of the Academy of Sciences of Stockholm, (under the article Phaliena Graminis, Phaliena Secalis.) We that which has been known in the Angoumois for several years. We were aware that there are to be found in North America many European insects, and this may easily have been transported into the United Provinces with grain. Its manner of living is the same with the caterpillar of the Angoumois, and although we cannot with certainty pronounce upon the identical species of these two insects, we are nevertheless persuaded that they are of a species so nearly alike with that which is the subject of this memoire, and that which is found in the Angoumois, that their identity may be almost pronounced conclusive.

We cannot do better than trace in as few words as possible the very interesting observations which have been made on the subject by Messrs. du Hamel and Tillet, one of the gentlemen associated with us in this memoire. The methods which they took to effect the destruction of these caterpillars which attack the corn in North America, appears to us very proper. Messrs. du Hamel and Tillet observed that the caterpillars which attack the grain of the Angoumois were of two sorts, the one being the Phaliena Granetta; and the other, which was the object of their particular researches, appears to us never to have been described by any other person than themselves, and some time after by Mr. Reaumur. These insects having begun their ravages in one particular canton of the Angoumois, they successively spread through the whole of that country, and afterwards penetrated as far as the neighbouring provinces, particularly those which have any settled commercial intercouse in corn with the Angoumois. Grains that have appeared very neat have each perhaps contained one caterpillar which soon transforms itself into a butterfly, which becomes the stock of an innumerable line of caterpillars. It is thus that this plague spreads itself very quickly. It also happens, although more rarely, that the butterflies flying as far as the distant countries, carry their eggs thither and propagate also caterpillars. But it requires a combination of several causes, which does not happen very frequently, to favour the increase of these little animals; for if this plague was not naturally stopped since the time that Messrs. du Hamel and Tillet made their observations, they would without doubt ere this have over-run the kingdom.

The butterflies lay their eggs upon the grains of the corn. This has been verified: this fact has been noticed by our observers, and we do not find this assertion weakened even by the contrary opibirth to new winged insects, which shew themselves at harvest, and lay the eggs intended to produce caterpillars upon the grain, where they are intended to pass the winter.

The germ is almost always destroyed in corn thus attacked, and therefore it is but seldom that any are fit for seed; the heaps of corn inclosing caterpillars or aurelias heat considerably, and by this means those grains which are sound become injured as well as the rest.

To prevent the increase of these insects various methods have been tried, which we shall briefly relate. People were advised to cover the heaps of corn that were laid up in the granary, with a bed of ashes of a certain thickness, not only with an intention of preventing the escape of the butterflies, but to prevent those which may be out of the heap from laying their eggs upon the grain. This is only proposed under an idea that it may lessen the evil, without entertaining the least prospect of destroying them altogether.

It was also thought that, in shutting up corn in casks close stopped down, the want of air would destroy the insects; it is upon this principle that the Americans entertained the notion of placing beds of hay about the corn mow. But all these schemes have proved ineffectual: insects can live in an air highly vitiated, and it is conceived that a very small portion of that element is sufficient for their existence.

A sprinkling of salt and vinegar upon the heaps of grain attacked by caterpillars has been used but without success.. Some particular people propose in the course of the time to give the grain a degree of heat sufficient to hatch the eggs, but without being sufficiently strong to destroy the germ. It was hoped that by washing the corn afterwards with extreme cold water the insects would be destroyed before they could find a retreat in the interior of the grain. But how could cold water be expected to do that which rain and the spring winds could not effect? since Messrs. du Hamel and Tillet are satisfied by very exact experiments, that where grain contains caterpillars, although they may have passed the winter in the earth, they are not prevented from escaping in the spring under the form of butterflies.

In some districts the grain has been exposed to the sun, but it has been remarked that the degree of heat communicated to the corn was not sufficient to destroy the insects.

Messrs. du Hamel and Tillet have not found any absolutely necessary that the grain which comes from America to Europe should be made perfectly clean, in order to prevent as much as possible the disease from being conveyed to countries where it does not at present exist.

Messrs. du Hamel and Tillet are convinced that by the means of stoves it is possible to procure such a degree of heat as would effectually destroy the insects without injuring the germ; but this method, too expensive to be generally used, appears to them besides to require too many precautions to be left to the sole direction and discretion of the generality of farmers:

Mons. the Abbé Roberjot, a correspondent of the Society, has been employed with some success in destroying those insects which attack the vineyards of Maconnois; a proceeding which, as it appears to agree with the present circumstance, we have thought it right to detail. Having observed that the butterflies that produce caterpillars are of the same kind with those that only fly by night, and which precipitate themselves towards the light, Mr. Roberjot made several fires at the dusk of evening, into which great numbers of these butterflies threw themselves. These fires were made of old vine props, damaged straw, bushes, and other combustibles of small value. The caterpillar that is found in the Angoumois produces also a night butterfly which Messrs. du Hamel and Tillet have observed naturally betake themselves to the light. We ought to remark that the night butterflies only appear about seven or eight hours, which is the time of their coupling and laying their eggs. It is this moment that the Abbé seizes to light his fires, and he has remarked that it is the only time that his method can be advantageously acted upon.

It is proper to observe that the ravages, at this time committed by the caterpillars in the Angoumois, are very little felt in the different provinces of the kingdom. There are sometimes found there a few of these little animals, but the state of the seasons appear to hinder their increase. In 1785, the corn of Poitou was attacked by a particular caterpillar (phaliena tritica) much larger than those in question. It does not lodge in the interior of the grain as the other does, but it devours it almost entire. As the caterpillars of Poitou are larger and more visible than those of Angoumois, it has been easier to remedy the evil which it occasioned by carefully cleaning the corn. Its mode-

March, 1789; part only of which I propose to transcribe, as being of the most consequence to our present purpose.

A letter from New York, September 1st, 1786, says, "that the Hessian fly lays its eggs on the young blade, which resemble what we call a fly-blow in meat, very small, and but one in a place."

None of the information relative to the mode of this insect's increase, appears satisfactory, this last is the only plain one; but had that been true, it is impossible it should not have been confirmed in the subsequent examinations, made by people who were roused into action by the order of council; indeed should it hereafter appear with certainty that the eggs are laid on the green blades of corn, and in no other place, there will still remain a danger that the aurelias fixed to the straw, should be beaten from thence by the flail, and sent here mixed with the grain, or that the flies themselves, whose presence in the barns is fully proved, might in like manner be brought to us in a torpid state.

Mr. Potts informs Mr. Bond, that having stacked his wheat of the harvest of 1788, he ordered, when the sheaves were thrown down for thrashing, a sheet to be spread under the rick, to prevent waste; on this sheet he found, when the sheaves were removed, many Hessian flies dead, or in a torpid state; but on examining the straw and grain, no signs of eggs could be discovered.

Mr. Bond himself examining a barn where the Hessian fly had not been known to injure the corn, found living and dead Hessian flies in it, and since that time the fly has made its appearance in that district.

I cannot conclude, says he, this paper more properly than in the words of Mr. Bond, in whose opinion I fully coincide.

"Satisfactory as it would be to my feelings, to be able to say with precision that I apprehend no danger of extending the mischief by seed, my duty urges me to declare, that I have not seen nor heard any conclusive fact by which I could decide on a matter of such importance; and till that test offers, the wisdom of guarding against so grievous a calamity is obvious."

I trust I need not further apologize for the length of these papers; I thought them of moment in any state of intercourse with those countries where these dreadful insects have prevailed, and for aught we know, still prevail; if they do nothing more than merely put us on our guard, the information, prolix as it may be, will not be upon the sandy loams about 10 pecks. We must always bear in mind that strong heavy soil requires more seed per acre than the more kindly loam, because a great deal more of it will perish either by not being properly covered, by having too much moisture, and being in consequence killed by the frost; or by having too much wet immediately after sowing which runs the soil together, chilling and destroying the young roots, or by forming so close a surface as to prevent many of the seeds from sprouting through. A poor soil requires more seed than a rich one, because, in the latter there is staple and nourishment enough to carry every plant through the whole season; on the contrary, in the poor soil, although every seed will vegetate as well perhaps in this as in the other, yet there will not be sufficient stamina to prevent, perhaps, one-half or one-third of the seed from perishing for want of nourishment. In like manner early sowing requires less seed than late, because every plant has time to expand itself, and to take good and sufficient hold of the ground without danger of being so readily thrown out by alternate frosts and thaws which late sown corn is always subject to.

PERIOD OF SOWING.—I have in the account of the last article said that most of our very best farmers sow very early. Mr. Ashby always made it a rule to sow upon his worst and coldest soil, perhaps at least 40 acres out of 100 for wheat, before harvest; by which method he conceived that he was putting the wheat upon that soil more on a par with that which was sown upon his better soil, and it enabled him to carry on the busy time of harvest without interfering with his seed sowing. I find that many of the enlightened farmers are getting into the same practice.

The usual seed-time is during the months of October, November, and December, as fast as the land can be got ready, but I think from the middle of October to the middle of November there is by much the largest quantity sown. Some wheat was sown in February 1802, by Mr. Fletcher of Warlingham on the side of a hill, fronting the west, adjoining the turnpike road leading to Godstone, and after turnips fed off, which had been previously manured with night soil; part of the same field, which is of unusually large dimensions, was a fallow, and manured with night soil; and the whole field being sown with spring wheat, vegetated kindly, looked uncommonly well all through the season, yielded largely, equal at least to his best forward sown crops; but that I take to have more resembling the condition of a well cultivated kitchen garden than plain arable land. But I learnt that those farmers always begin sowing as soon as the harvest is over, and before their vintage commences: whereas, when I arrived in England, and landed in Kent, they did not begin sowing land of the same quality before the end of October. The reasons which our farmers assign for late sowing is, that the weeds have less time to gain strength to injure the wheat before the severe weather sets in, by which means they are more easily destroyed; and again, if the weather proves dry, they will not sow, because then they are sure to have more weeds than wheat. Reasons more silly and weak could not well be given; for in the first place, to sow corn late, in order that the weeds may not be strong, is the same in effect, as to say, that they do not wish their corn to be so strong as to be out of all danger of frost, &c. for if it is so severe as to kill these weeds, which is their professed object, they stand a very good chance at least of killing no small quantity of the wheat: but no good husbandman will have his wheat land in such a state as to be full of the seeds of weeds, and therefore that is a bad excuse for late sowing. At the time the wheat was sown in France, which I have alluded to, there had been but one day's rain during the latter part of July, the whole of the months of August and September; yet, if they had been without rain before they had begun to sow, it is not unlikely that a great deal of their land would scarcely have been sown by Christmas. Nothing, however, could look better than their corn did, notwithstanding the extreme dryness of the ground; neither was it over-run with weeds, which seems so much to alarm our farmers. A relation of mine has this year sown all his wheat, by my advice, at least a month before any of his neighbours, without waiting for wet weather; the farmers, one and all, promised him a plentiful stock of weeds; his corn is, however, strong, looks well and is free from weeds; perhaps much more so than those of his neighbours, who were so lavish of their promises; it was equally forward in the spring, and bade fair to yield six quarters to the acre; but being on the side of a hill, it became lodged and much injured.

MANAGEMENT.—As early in the spring as the weeds appear, they are cut up with a spud or spaddle, and the thistles cut out with a hook. Mellilot, wherever found, is pulled up by hand;

serrated, standing three together, on slender pedicles and round, striated branched stalks terminated by long spikes of papilionaceous flowers, drooping downwards, which are succeeded by short thick pods, containing one or two roundish seeds: it appears to me to be biennial, and as it is often found in the hedges in many parts of this country, every possible pains should be taken to destroy it, ere it gets into the corn land.

The ononis or rest-harrow prevails very much in the eastern part of the county, and is a particularly troublesome weed to both plough and harrow; it roots deep in the ground, and is so strong as to throw the former out of the ground. The way I have always got rid of it has been by letting a man follow the plough with a sharp mattock, and cut it up as deep as possible. Docks should be carefully drawn up either by hand or a docking iron.

We have so little drilling, (unless it be in the sandy districts) that hoeing is no where else practised. In those districts after the first weeding, if the plants are weak and sickly, a good top-dressing should be immediately applied, but this I am sorry to find is seldom or never reserted to; if applied, on the appearance of a change of weather, it will assuredly very greatly help them. As soon as the corn begins to spindle, perhaps a fresh stock of weeds may appear; it is then usual to look over the crop again, and extirpate as effectually as possible, the cockle, chrysanthemum, and poppy. If seeds are sown among the wheat, the usual time to sow it is as soon as the ground is sufficiently dry, and there is no danger from severe frosts. By some farmers the seed is sometimes harrowed in, by others only rolled in, but this ought to be regulated by the quality, and the present situation of the soil.

HARVEST.—Near London, this very important season commences with rye about the beginning of August, which is followed by wheat, oats, pease, barley, beans, tares, occupying September, and perhaps part of October; indeed beans are sometimes not stacked before Christmas. The harvest, therefore, will be backward or forward according to the state of the season.

Reaping is performed with a hook, the blade of which is made like the sickle, but stronger, broader, and without any teeth: of course it requires frequently to be sharpened. Near London, the rye and wheat are bagged, but at a distance therefrom it is reaped, which makes a difference of from one to two shillings per acre in the price. The bagging is by much the neatest operation, because the farm, and is likely to be short of hands, he must begin as forward as possible, perhaps much forwarder than he otherwise would do, in order to secure as great a bulk as he can; for in such a season as those of 1803 and 1804, it is inconceivable how soon and in what quantity it sheds. Upon such farms I am assured that the loss upon the average of the crop has been near four bushels to the acre by shedding only; and especially the season of 1803 where hands were so scarce, and the crop large, that they found themselves obliged to carry it the same day that it was reaped.

I do not find it customary to sow either rape, turnip, or tares, among the wheat in the summer, except here and there a particular farm, upon some extraordinary occasion, perhaps where the crop of wheat may be very thin. It is so good a plan, that it is to be regretted that it is not more generally adopted, and especially as a few acres, according to the size of the farm, can be no object in point of expence should they not succeed, but if they do, they may be almost invaluable; because, if the winter proves very severe, with intervals of wet and dry frosts, the forward large turnips are sure to be much injured if not entirely destroyed; whereas the turnips among the stubble will be so protected by it, and neither being so large nor so forward are less liable to be hurt, and will afford a very acceptable supply in a time of great need. The same may be said both of rape and tares, which are often found to have withstood such a season when the regular crops have been cut off.

The only objection to this practice is, that it may break in upon the regular courses of a farm;

but that, I think, is the most trifling objection that can be urged, because he must be a very confined farmer who cannot vary his rotations so as to take advantage of every sort of season that may present itself; however, as this is not the place to enter minutely into the subject, I must content myself with having thrown out the hint.

Threshing is generally performed by the flail at the price stated under the article of labour, that which is performed by the machine is done by the day, and those farmers who pride themselves upon imitating or excelling the Essex people in the trimness and beauty of their trusses of straw when made up for market, will naturally object to the machine; because, in order to get out all the corn, the straw becomes very much bruised, and although equally good as the other, it will not fetch so much at market by 5*s.* or 7*s.* 6*d.* per load, owing to the upon it, than upon the usual solid one, I have no doubt at all, that it would be less bruised upon it.

These floors are made of two inch yellow deal, 12 or 14 feet long; six planks wide, with an opening of an inch or 1¼ inch between each plank; the whole secured by three cross bars of the same materials and width. The sheaves are then laid on this floor loose, in the same manner as they are usually laid on the barn floor. Two men then thrash opposite to each other, beginning at one end and making a diagonal stroke after each other; they cut every part of the sheaf, and when they have sufficiently beaten it, the board is gently lifted up, which lets the corn pass between the planks, the straw is carefully turned over, and they begin thrashing at the end where they left off, striking and moving along, until all the straw upon the floor has been beaten over.

It is more than probable that this last beating will have effectually knocked out all the grain; and if this be the case the straw is taken off, the board is lifted up, and the grain swept from under it, to one corner of the barn floor; the false floor is then placed in its former situation, and fresh sheaves are placed on it, and the thrashers proceed as before. From the several samples of corn which I have seen, that have been thrashed out upon these floors, before it was made up for market, the grain appeared to be much less bruised than it usually is upon the solid floor. It was upon these moveable floors that not only the corn and pulse, but all the lesser and finer sorts of garden and flower seeds, were thrashed out for above forty years at my late father's, whether thrashed in the open air or in the barn.

The use of these moveable floors to a farmer are of more importance than at first sight may seem probable; especially, where barn room is short, and the more so as it is uniformly admitted that thrashing in barns is a very unwholesome employment for the men. All the apparatus that is necessary is a good sized tarpaulin, which is useful upon other occasions, and about a dozen of large mats; these are spread out upon a smooth piece of ground made free from stones, the tarpaulin laid on the mats, and the floor placed upon that; turnip or rape seed, buckwheat, trefoil, rye grass, or sainfoin, or such like seeds may be thrashed out, in the field, without the risk of shedding of the seed by loading and unloading, or of being spoilt by contracting either damp or heat in the mow.

considering, however, how much of it is cold, wet, shallow, or sandy, we have no reason to complain of the produce.

Millers.—The surplus produce of the farm, after sowing is over, almost always eventually, as far as respects this grain, falls into the hands of the miller; we must, however, make some exception in plentiful years, for that portion of it which is appropriated to the distiller and starch maker.

I have before said that ultimately it falls into the hands of the miller, for although the jobber and merchant may and do buy up large quantities and deal it out to market, whenever the price is sufficiently high to afford them a large profit; yet eventually it finds its way to the mill. It would be well, indeed, for the community, if from the miller it went directly to the baker or to the consumer; but that is not always the case, for there is the jobber in flour, and the flour factor, who are each of them to get a living before it gets into the hands of the baker; each of these parties, with the exception of the latter, make a larger profit in the aggregate than the grower, with less risk, capital, and anxiety.

If every one of these parties were strictly honest, with respect to the flour from wheat, there would be no occasion to mix bean and pea flour and that from other inferior grain, much less whiting, plaster of paris, chalk, and the like, either in times of the greatest plenty, or in those periods of scarcity, where that little ought to be as pure and unadulterated, when it comes out of each of their hands, as was the grain from the barn floor.

As Mr. Middleton very properly says, the baker is generally most completely under the thumb of the miller, the mealman, or the jobber in flour. By giving this man credit beyond the usual time, (which according to the custom of the trade, is, I think, to pay for the first load as soon as the second is delivered in,) and by extending the payment to the third load, the dealer thinks himself at liberty (and, indeed, too often takes it) to pass off such flour as he pleases, and be it ever so much adulterated, the baker scarcely dares complain; he has often, therefore, no alternative, because he may, perhaps, be a young beginner with a small capital, or he may have a large family to run away with the profits of his trade faster than he can well afford, or he may be situated in a part of the town, where he may be obliged to give large and long credit, and without capital enough to allow for it.

How different is the situation of the miller: let he wants, when in fact he may not have bought that day a single sack; to oblige them, however, as a few loads are never any object to him, if they can agree about price, he will take what they have got; but upon looking at the samples he throws so much difficulty in the way, as at last to get the corn at his own price. Thus it fares with the pitched market, and with the corn that is brought there; but the farmer, who takes his samples only, has not the risk and expence of bringing back his bulk and taking it again, if the market price does not suit him, because having sold it by sample, he carries the bulk at once to the buyer. I have often known more corn sold after the market was over, and in this way, than in the course of the public market.

I appeal to every man conversant with those markets for the truth of this statement. Thus, the farmer has all the toil, care, and anxiety, and runs all the risk of raising and bringing the commodity to market; and when he has so done, the fair and liberal profit of it is, in too many cases, cut up by the artful contrivances of the miller; and, what is worse, the public must be served, not only with such quantities at a time as he pleases, partly at his price, but are obliged to put up with whatever surreptitious mixture he may choose to send out. It is well known also, that three or four of these men, especially if they be friends, can lower the market as they please, or they can raise it in the same manner as the jobbers in stocks do.

That great abuses of the description I have alluded to have very much prevailed in this county, I am assured on the authority of a noble lord, whose exertions in agriculture do him infinite honour, and his great activity as a magistrate entitle him to the thanks of his countrymen. Not only this nobleman, but several gentlemen and farmers have agreed in the fact, and it is on this account that many of the latter, and one of the former, have erected mills on their farms, and by uniting the profession of miller to that of farmer, have endeavoured to counteract the evil tendency of those abuses, so far at least as it respects themselves; and it is to be hoped that the public will also reap a portion of the benefit, by increasing and multiplying the competition.

In a part of Buckinghamshire, at no great distance from Wooburn, where three years ago I was in the habit of going regularly once a month for above twelve months, and staying there some days

I may, perhaps, be asked what this has to do with the county of Surrey? to which I answer, that as the abuses and malpractices of those engaged in this profession are becoming more and more alarming; every circumstance that can tend to expose them, in whatever quarter they may arise, ought to be made as notorious and public as possible, as the means either of lessening the evil, or of inducing the legislature to take the subject into their most serious consideration.

Remarks.—If we consider the number of persons employed in the growth of wheat, the expence of cattle, and the wear and tear of country utensils, we may presently see that there is no impropriety in calling the culture of wheat a manufacture, and the very basis of all other manufactures. Indeed, in some respects, it surpasses most other manufactures, as it supplies constant employment, and though moderate, yet generally competent wages, which labour can always command; as corn is an article that never suffers from fashion. When the bounty on the exportation of corn was effectually established, Mr. Gregory King's very curious and accurate calculations were made public, which shew what at that period was the produce of England in that grain; and so soon were the good effects of that law either felt or foreseen, that it began even then to be considered as a staple. By a reference to that work, we shall see that in 19 years from 1746 to 1765, deducting the value of wheat imported within that space, we exported in that grain to the amount of £10,365,606, which at an average, is £545,558 per annum. All in our own shipping, which is another and very superlative advantage.

The annual growth is stated to be 32,372,824 bushels, or 4,046,603 quarters. Of this he computes that there are spent in bread 30,000,000; for other uses he allows 720,000, and fixes the exportation at 1,652,824 bushels. The weight of these bushels are computed at from 56 to 60 pounds each. The mealmen who choose rather to buy by weight than by measure, agree that a sack (which contains four bushels) shall weigh two hundred and twenty pounds.

If Mr. Middleton's calculations are nearly correct, the average quantity of land in South Britian annually under wheat about the year 1795, was 3,850,000 acres, which at two quarters and a half per acre, will produce 9,525,000 quarters, or 76,200,000 bushels, which is more than double what it was in the periods before-mentioned; and of this quantity not less than 1,300,000 bushels, I have great

We must not however, bring our inquiries down to the beginning of the present century, otherwise we shall find that the price has been as high as £50 per load, or 25*s.* per bushel, which is above three times the usual price.

The annual consumption of wheat in London only, is about 700,000 quarters.

An Account of the Quantities of Wheat and Wheat Flour imported in Great Britain in the Years 1800, 1801, *and* 1802, *distinguishing the Countries from whence they were imported, and also the Quantities exported during the same period; together with the Amount of the Bounties paid on Corn imported.*

	1800.					1801.					1802.				
	Wheat.		Wheat Flour.			Wheat.		Wheat Flour.			Wheat.		Wheat Flour.		
	Qrs.	bus.	Cwt.	q.	lb.	Qrs.	bs.	Cwt.	q.	lb.	Qrs.	bs.	Cwt.	q.	lb.
Denmark	20,950	2½				8,013	5				110	0			
Russia	81,508	0	699	2	3	174,219	1	414	3	19	8,025	3	2,240	0	0
Sweden	21,496	7				13,194	1				5,982	5			
Poland	183,485	4	4	2	0	208,712	5	169	3	18	126,699	1			
Prussia	482,466	2	9	0	2	319,270	0	4	3	12	208,130	5			
Germany	290,334	0	39,974	1	1	288,305	1	5,194	3	9	30,644	5			
Holland	57,898	2½	1,784	0	6	92,063	3	6,164	1	14	1,308	0	4	0	0
France	224	0						7	0	0			5,285	2	20
Portugal	3,020	0	2,244	2	23	104	2	54	0	0					
Spain	307	0						80	3	20					
Gibraltar						3	0								
Italy								216	1	21	495				
Malta						2,405	4								27
Ireland	181	0	2,168	3	21			1,883	3	14	86,938	4	79,031	3	3
Guernsey & Jersey	120	0													
New England			10,553	0	8	1	2	18,758	0	11	280		2,363	0	12
New York	2,112	2	102,632	2	22	21,032	2	253,486	1	0	14,522	1	91,901	1	3
Pennsylvania	631	0	65,837	3	9	55	5	103,567	2	2			15,257	0	21
Maryland	21	2	88,670	1	15	78	3	154,990	2	16		5	49,871	0	11
Virginia	611	4	37,749	3	3	2,270	1	167,800	2	14	4,952	1	33,218	0	3
North Carolina	34	4	1,454	2	19			4 518	1	17			1,641	1	10
South Carolina			1,750	0	0			11,006	3	22			93	1	0
Georgia			1,049	1	5	53	0	655	0	26					
Newfoundland								61	1	0					
Canada	19,420	4	6,421	2	11	55,113	3	41,798	1	19	69,548		19,626	3	15
Nova Scotia			11	2	0	519	0	10	1	23			31	0	7
Florida								1,797	1	21			14,457	2	23
Total imported.	1,173,772	2	313,010	3	8	1,180,413	6	832,544	1	18	557,636	6	815,022	2	15
Exported.	6,389					5,227					104,418				
Balance in favor of imports, and against England,	1,167,884	2				1,175,186	6				453,223	6			
Amount of bounties paid on corn and grain imported into Great Britain.	44,836*l.* 18*s.* 9½*d.*					1,420,355*l.* 1*s.* 1½*d.*					715,323*l.* 16*s.* 4*d.*				

From the preceding statement of imports and exports for the last three years, ending in 1802, it appears how very largely the balance is against us. In 1800 which was not by any means a scarce year, but on the contrary a productive one, it amounted to above 1,167,384 quarters of wheat, and of wheat flour to above 313,010 hundred weight. In 1801, which was the great failing year, it amounted to 1,180,413 quarters and upwards of wheat, and of flour to 832,544 hundred weight. In 1802, which was a productive year, it amounted to 453,223 and upwards, quarters of wheat, and of flour to 313,022 hundred weight. If to this we add the great quantity of specie which must be (and is, I believe, generally) drawn from this country to pay for that corn, together with the immense amount of the bounties, which were paid upon the importation, in order to induce our cost, freight, bounties, and other charges, particularly insurance, the actual amount in money paid by this country for the corn I have stated to have been imported, over and above that which was exported, (but for which no drawback or return of bounty was allowed; because, no part of the corn that was entered for home consumption was permitted to be re-exported) during the three years of 1800, 1801, and 1802, was not less than ten millions, or upon the average of those years, upwards of three millions, three hundred thousand pounds; and probably a great deal more.

If as much encouragement had been given to the inhabitants of this kingdom, since the institution of the Board of Agriculture, (and which was particularly recommended by every person employed by that board in drawing out the first reports of the different counties,) to inclose the several wastes therein, by removing those idle and trifling obstacles that might appear in the way of such inclosures; by advancing, from time to time, on the best security that could be obtained, a small portion or even the whole of the three millions, no matter, as it would be spent among ourselves, and in that case, it would be only changing hands, subject however to the discretion and government of certain commissioners, to such persons who might require it, in order to bring the wastes more speedily into cultivation; by assisting those small farmers who from the want of capital, the badness of their crops, the increase in the price of labour, poor rates, tithes, &c. were actually starving, and at last obliged to apply to that parish for relief, to the poor of which they had formerly been liberal supporters, and who, by the bye, had as good a claim to that assistance from government as any set of merchants whatever, be their consequence what it may; by raising a fund to buy up, and finally to abolish the fatal and always obnoxious system of tithes; and by putting a bar to those tyrannical covenants in leases, which deprive the public of their due quantum of provision, and the farmer of the full benefit of his skill and industry; is it not probable, that so far from 1*s.* of these 30 millions being sent abroad to buy corn to enrich the farmers and the governments of other countries, we should have had a large produce at home, equal in any season to our most pressing exigencies, and what is not at all unlikely, that we should actually have been exporting probably to as large an amount, and receiving back either in money or native raw commodities, such articles as we might been paid to foreign countries for the like articles. The committee advert to the increased price of labour, and the restrictions of the present corn laws as if they alone were the causes of these alterations; they no doubt are partially so, but the great causes must be sought for in the system of tithes, which compels many a parish, such as Buckland, Lingfield, Crowhurst, Oxted, &c. to lay corn land down to grass, rather than submit to an extravagant composision for the same, or the more obnoxious dilemma of having their crop taken in kind: in the vast increase in the consumption of meat, butter, and cheese, within the last twenty years; and in the great falling off in the supply of those articles from Ireland, which has necessarily produced a competition in many of the interior counties among the farmers, to become more of the grazier or dairyman than the corn grower; especially in those parts where the land was suitable to either of those purposes, and especially also among such farmers as having been bred to some other profession, or brought up in other counties where the cultivation and the cultivators of the soil were different in principle and manners; for such men are sure to turn their arable into pasture, in order that they may have less occasion for cultivators, and consequently be able to manage their farms with less trouble, less risk, and less fatigue.

But Mr. Cobbett gives, in his paper of Saturday 16th June, 1804, other reasons why this new code of regulations recommended by the committee, will not make this country capable of producing and exporting grain as formerly.

The article of freight alone, he says, is nearly doubled within these last 17 years, and shipping even with that advance is a notoriously losing concern, by the excessive tonnage dues lately imposed, added to the high wages paid to seamen at this crisis. If bounties are granted when the price of corn is higher than the present limited standard export price, the public will complain, and the poor will be much injured: add to these evils, the bounties are a deduction from revenue; the solution of the whole is, therefore, that while we have paper money, anticipated revenue, and consequently excessive taxation, we cannot grow, much less export, grain upon the same terms, or navigate our ships at so low a rate of freight as the Americans, Prussians, and Russians do, where land is cheap, and labour and taxes moderate.

This mode of considering the subject is, however, not altogether correct, because it is very upon the return of peace; and as our capital enables us to give longer credit than any nation, I am not clear whether that circumstance only may not be equivalent to the difference in the price of the freight, and together with the superior quality in the corn itself, give us a decided preference at every market in Europe, or elsewhere. At home, a great increase in the productions of the earth would naturally reduce the price of those articles, and that would as certainly bring down the price of labour; because, if from this great superabundance we are obliged to sell that for 10*s.* which now brings us 15 or 20 at the cheapest time, we must either increase our capital, and make up by the quantity of corn sold for this difference in the price, or we must reduce the price of labour and rent, in proportion to the decrease in the money price of the corn, or the farmers must inevitably break; and the farms by falling into fresh and untutored hands, instead of being productive, would soon fall to decay, to the entire ruin of the landed interest and consequently of the country.

I have said that an alteration of the poor laws would make a vast difference in the price of the productions of the soil, because, as the law now stands, the great burthen of the tax falls upon the land. A farmer renting to the amount of £300 a year, with a capital of less than £3000 in many parishes in this county, is at this time paying £100 per annum to the poor; when a great manufacturer, merchant, or distiller, with a capital of 100,000, and clearing perhaps, from 8 to £10,000 per annum, does not pay more; and if to this we add the gross profusion and mismanagement of the poor houses, the facility with which the idle, the lazy, and the debauched can gain admission into those houses under fictitious pretences, the enormous and abominable amount of the law charges, if all these were simplified and confined within certain bounds, we might reasonably hope that one half at least of the present rates would be sufficient to maintain all the real poor throughout the kingdom.

By the abstract of the returns, made under the act, printed by order of the house of commons, it states, that the total money raised by the poor rates in England and Wales within the year, ending Easter 1803, amounted to £4,952,421 14*s*. 11¼*d*. and the total expenditure as made up from 13,889 returns received, at £5,128,846 13*s*. 7¾*d*. and as there is a deficit of 707 returns, the whole expenditure is expected to form a grand total of prevent it, and if they are already strong enough, they ought to be strictly enforced, and a way may probably be found out to set those to work who are desirous to support themselves by their own labour, (I speak not of a time of war, because the greater part of the idle males are then otherwise disposed of.) If this could be brought about it would not only put a stop to that course of vice which is the consequence of an idle life, but it would tend greatly to enrich the commonwealth; for if the industry of one half the people maintains in some degree the other half, to what pitch of wealth and greatness might we not be brought, if one limb were not suffered to draw away the nourishment of the other.

If laws, high duties, or prohibitions may force the merchant to quit a trade esteemed hurtful, and if the want of this branch be found in the event to impoverish us, and to enrich those parts that have obtained it, by what industry is it to be recovered? And when by errors and false steps, trade has been once lost, did it ever return to any country? If such be the case, how must it behove our legislature to take the most speedy and effectual measures; by removing all obstructions, however great, in order to place us in the same state of independence we were in during the 40 years in which it is stated that we exported corn to the amount of £700,000 per annum. Our farmers want neither the spur, the knowledge, nor the capital, they only want the protection and support of a wise legislature, and a proper degree of liberality and confidence on the part of the land owners, to enable them to make (that which no other nation upon the earth can do with theirs,) nearly every inch of this kingdom highly productive.

If I am asked what these obstructions consist of, I will relate two from a great number which I have met with, and which have occurred since I wrote the remarks on leases. A farmer in this county has shewn me a lease recently drawn up by an attorney at Horsham, wherein among other ridiculous covenants, the tenant is obliged to lay on so many loads of dung per acre as a dressing for every wheat crop, under a penalty of £10 per acre; so that if the tenant has the best pea or bean gratten, or the best clover or sainfoin lay in the world, and which he may have dressed with the most expensive manures, bone ashes, soot, woollen rags, or what not, fetched at a distance of 30 or 40 miles, yet because neither of those may be dung, though probably on some occasions, and on covenants in his lease. Notwithstanding such harsh treatment of a young tenant, who was laying out his money in repairs of buildings, to more than six times the amount of what he was allowed, and sinking a capital in improvements on the farm with a liberal hand, and as far as he could judge, in a judicious way; yet could this steward find a difficulty in admitting the allowance agreed upon, and actually received the full rent, putting off the settlement of the account until the succeeding rent-day; for which the tenant had no remedy without flying in the face of his landlord and his agent, which certainly would not have been policy.

Now every body knows that a good clean pea or bean gratten is an excellent preparative for wheat; especially if the land is also in good heart; and there are few farmers who will deny that where land is not tired of clover or sainfoin, either of those is perhaps the very best course for wheat that can be pursued without any top-dressing on the lay, and particularly where the land is clean and has planted well; and what is of no small consequence to a farmer, it gives him an opportunity of applying his dung to some other crop, or other part of his farm, that may stand in need of it.

In the parish of Godstone, a farmer broke up a foul hungry wet piece of sward containing about four acres, intending, when clean and laid dry, to lay it down in the best condition into pasture, as he was very short of grass land; the steward, being also a lawyer, actually levied the penalty of £10 per acre; and this poor fellow now pays, and has done for three or four years, £40 a year for those very four acres, which he offered good security should be laid down as soon as he could get it dry, clean, and in good heart.

Are such covenants as these when strictly enforced, and in the hands of lawyers and agents, encouragements to agricultural pursuits? Can we raise a superabundance of corn with the present quantity of land in tillage under such legal restrictions? And if more land was brought under cultivation, with all these impediments in the way, are we likely to meet our neighbours on the continent at foreign markets upon as low or better terms than they can, even if the price of freight, &c. offered no objection to it? I am afraid not, and yet how strange a system, when we are all ready enough to admit that to land only we can resort for the comforts of life, and for the chief support of the independence of our country.

The regulations which the corn committee have tainly mistaken. The crop of 1803 was perhaps greater than has been known for many years, and the quality finer, the stock in hand was comparatively nothing, and therefore these two circumstances would not have depressed and kept the markets so low. We must therefore seek for other causes, and these will be found in the tardiness with which the great millers, mealmen, merchants, and jobbers have come forward to buy, which they have only done from hand to mouth as it were, instead of filling their stores, warehouses, and magazines in a large and speculative way, on account of the continued apprehension of invasion.

At other and more favourable times these men do not mind locking up a large capital in these articles for a very considerable length of time, under the prospect of great advantages thereby; but in times like the present they buy but little, and sell that again upon the smallest rise, and as quick as possible; making up by the quickness of the return for the smallness of the profit. By this means the markets are always kept down; but was peace again concluded, though there would be less demand from Government and less waste, yet the speculators would immediately return to their old practices, and by buying up all the corn as fast as it came to market, create an artificial scarcity by feeding them according as their ideas of profit may lead them. And this rise would be sufficient to counteract the object of the above regulations; and nothing can conduce to it, but by convincing them that a very large increase of land thrown into cultivation, and favourable crops attending that, together with a removal of the causes I have before-mentioned, would operate to produce a stock infinitely greater than we can consume, and much above their abilities to forestall: then and then only can we expect to derive any benefit from those regulations, and draw a permanent revenue from other countries by the superior cultivation of our own.

RYE, SECALE, HYBERNUM ET VERNUM.

Triandria digynia. Linn. Sp. Plant.

There are four species of this genus, one of which only appears to be grown by the farmers of this county, namely, the winter rye. In particular seasons, like the present autumn for example, a great breadth is grown, especially upon the hills and the sandy district, partly for a crop, but more generally for early spring feed. It is also sown sometimes with tares, under an idea that it tends to keep the shoots and branches of that plant from out immediately, and sold for seed, at from 36*s*. to 42*s*. per quarter. This was about the price last season.

The straw is sometimes worth from three to five pounds per load of 36 trusses; and is in great request by the London brickmakers.

For very early sheep feed, and before the winter tares are ready, it is a very useful article; but it requires to be fed off very quickly, or else when it begins to spindle, a principal part of the plant is wasted and lost, as sheep do not then like it, because the stem or straw becomes hard and wiry. It is a great article with the cowkeepers, who generally grow as many acres to cut green as will carry them on until the tares come in.

It is certainly advisable in every sheep farmer to grow a few acres of it, every year, according to the extent of his stock, for it may be fed off, and the land got into high condition for turnips, or be cleansed, if foul, for wheat, and especially as it adds to the stock of provender at a season when fresh food is often so scarce as to put the farmer to every sort of shift to carry on his stock; and it is found by every day's experience that the greater the variety of food, the better the stock will thrive.

This plant loves a dry gravelly soil even if it proves thin, it does not dislike either chalk, sand, or loam; but it does not grow kindly upon the strong cold clays.

In those soils that are suitable to it, it grows strong and very tall, much more so than wheat, the ear is less, with shorter, sharper, and rougher awns. The grain is less in size, thinner and darker, the root does not ramify so much, nor is it so full of fibres as wheat, and therefore does not exhaust the soil so much. It is in general forwarder by one month than any other sort of grain; the weight of the bushel of rye is from 55 to 60 pounds.

The consumption of this grain for bread, used formerly to be much more considerable than at present; it is looked upon by many to be rather unwholesome than unpleasant; it is supposed to be difficult of digestion, and therefore only fit for labouring people. The Germans and Poles of all ranks eat it, and no people are more robust, or can go through more severe fatigue, which circumstance they attribute to the use of this sort of bread.

Mr. King estimates the produce of rye in his time at 10,000,0000 of bushels; another author has estimated the growth of his time, viz. 1770,

BARLEY, HORDEUM VULGARE.

Triandria digynia. Linn. Sp. Plant.

According to Wildenow there are ten species of barley, of which seven are annual, two perennial, and one bulbous rooted.

There are also some varieties of the common barley, such as the blue barley, and the black seeded barley, which latter is biennial. Of these several sorts, the common barley, as it is called, is that which is cultivated by our farmers, from which there are some seminal varieties, distinguished by the names of the long eared barley, and the short eared barley with long awns. There is also the winter or square barley, which is grown about Guildford and Bramley, and which Mr. Barret informs me, not only stands the winter well, but bears feeding down in the spring once and even a second time, and then yields an abundant crop.

The sort of barley, which our farmers most esteem for sowing, is that which comes from Norfolk, or from Kent, either the isle of Thanet, Faversham, or Sandwich, &c. where the soil being peculiarly kind for this corn, produces a short barrelled grain, swelling greatly in the centre, tapering quickly therefrom to each extremity, of a clear pale colour, with a clean, thin, skin.

If some seed is at all diseased or heated, it will shew itself at each end, by being there of a darker tinge of red or brown; such barley is neither fit for the farmer nor the maltster. In fact, where it has much colour at those parts, I am of opinion that the prima vitæ is destroyed; for upon examining it with a very fine microscope, and taking off the skin to the pulp, it will be found that the same tinge has made its way to the kernel, which is of a dull and deadly cast; it will therefore very seldom vegetate. Even poultry are not fond of it.

Barley is sown in all the hilly, chalky, and sandy districts, whether they be inclosed or open fields, extending from Smitham bottom, Westerly, through Guildford to Bramley, and on the left of the road to Farnham.

It generally succeeds a crop of turnips fed off, but sometimes wheat, and at others peas. The land is always got into a good pliable and working condition, or in other words reduced to a fine tilth, and as it will bear sowing later than most other crops, it is usual to avoid sowing it in wet weather, as well as for some time after the land has been in a wet state; but of all grain, it will the least bear the soil to run together after it has been sown.

upon the land where they grew. When barley is sown after wheat, there is more than a probability that the land was previously well dunged and cleaned for that crop, so that it does not appear necessary to dung at all previous to sowing the seed, but in the way I have before-mentioned, although there may be times and seasons when it becomes necessary that the plants should be top dressed.

There is nothing unusual in the mode of preparing the soil, either in the inclosed part of the country or in the open field, where the allotments are large and wide; we therefore find the farmers cross ploughing at every alternate stirring; but where the several parcels of land are narrow, it cannot be done; and it is in these remains of barbarous times where the spirited agriculturalist is foiled. It is not customary even here to lay the land in ridges, for if the soil is proper for barley, there is seldom any occasion for it; and, therefore, they only take care to have water furrows struck in such directions as may best carry off any violent rains.

The land generally receives first a light or thin ploughing; it is afterwards harrowed down, and then cross ploughed deeper, and the seed sometimes ploughed in, but more usually harrowed in. If seeds are to be sown, whether trefoil, clover, or ryegrass, they are to be sown after the barley has had one harrowing, a light harrow is then run over the ground, and lastly, a barley or light roller is passed over the whole of the work.

I am of opinion, that, where the seeds are to be sown with barley, the latter should invariably be ploughed in with a shallow furrow, for it is very clear, that the seed would be more regularly deposited, and be less liable to be disturbed by the harrowing in of the seeds, which cannot be the case when barley is harrowed in; again in light soils, it should always be ploughed in in order to give the plants more strength, and the seeds should only be bush-harrowed in. All these operations must be performed in dry weather; by that term I do not mean to exclude gentle rains, if they are not likely to be lasting, because of all grain, it is fond (if I may say so) of clean work; now scarcely in any soil will it admit of the work being done clean if done in wet weather; on the contrary the soil will shove before the plough, clog the harrows, stick to the rolls and the like.

Steeping is no where practised, nor is it so necessary as in wheat. To secure, however, its regular vegetation, two things are absolutely indispensable:

maining there a given time, it follows, that a difference will arise in the progress of their vegetation, however regularly and uniformly the seed may be deposited. Indeed, unless the season is very late or the seed old, I do not think that steeping is at all necessary; on the contrary, there are not wanting many instances where it has done a great deal of harm; because, it may have been too long steeped, and a series of wet weather may follow, in which case it is evident that none but the very strong and full kernels will vegetate, the rest having putrified or become rotten: even among those seeds which have vegetated, the weaker plants will inevitably perish. It is a fact which cannot have escaped the observation of every naturalist, that nature requires no previous steeping, she scatters her seeds with a liberal hand over the surface of the earth, but then many of them become exposed to all weathers, and a superabundance of wet. Upon examining those which are so exposed, they are generally found to be rotten, or if hard, to be turned black and killed; whereas those which have met with shelter and protection, vegetate in due season.

I would, therefore, advise every body to be very cautious how and what they steep. The practice has been always common among nurserymen most certainly, but the reason why they adopt it is very different from that made use of by farmers. It is more generally applied to foreign seeds, particularly those which come from the East or West Indies, the Cape, or America, the age of which may perhaps always be doubted; the seed may also be contained in a hard nut or shell, and then it would remain in the ground twelve months, and even two years; the steep, therefore, is only useful to quicken vegetation, and to prevent the seed if already old enough, from drying up and perishing before it could break through the shell; it is to be particularly observed, however, that these seeds when sown, are protected from the weather by glass cases, and therefore, they are not likely to be saturated with wet, or injured by the frost while in their moist state. The best steep for this purpose that I ever saw, was warm milk.

Seed.—Having already said that barley will bear sowing later than any other seed, because of the quickness of its growth, and natural tenderness, it naturally follows, that the quantity of seed sown ought to depend upon, or correspond with, that period; our best farmers pay great attention to this circumstance. If the land is in good heart and fine upon the farm, its proper season of sowing should, if possible, be so anxiously and carefully attended to as never to be suffered to be passed by; for as few crops succeed when an uninterrupted series of dry weather takes place at this season of the year, especially upon the hills, whether the soil be silicious or argillaceous, so barley is among the worst crops to meet with such periods. These observations apply to spring barley only. Winter barley is sown in October.

Culture.—Some soils are very apt to produce charlock, which is found in very great abundance upon the chalks in this county; there are two varieties, the yellow and the white, and the farmers tell me that the latter is by much the worst, or rather the most troublesome weed. In some places it is hand weeded, at other places it is suffered to grow until it out tops the barley, and then it is mowed, that is, cut above the corn, which checks it so much as to permit the corn to gain the ascendancy, by which means the charlock becomes weak and decays. When the barley is drilled, the ground is by some hand hoed, and by others horse hoed: but the hand hoeing, although the most expensive, is by much the most effectual, and therefore more than compensates the difference in the expence.

Harvest.—This busy period generally commences, after the wheat and oats, as must naturally be the case, from the general lateness and inequality in the time of sowing. Upon the warmest and least exposed situations, it commences between the 12th of August and the 20th, and so continues during that and the succeeding month. It is a crop that is very subject to be injured by a dripping harvest, for being mowed into swarths in the manner of hay and not bound into sheaves, as is sometimes the case with a strong, heavy, crop of oats, it follows, that the corn, by thus lying down, is subject to be injured by a damp humid ground as well as by the rain; it is usually mown with a scythe having a bow or cradle fixt to it, generally made with ash, willow, or hazle, but sometimes very neatly made with iron. In fine dry weather it lies in the swarth until the upper side is quite dry; it is afterwards turned and dried in the same manner, then raked into heaps, and carried into the barn or rick, where it is pressed down close, either by the treading of a horse or by men.

If there is a heavy crop of clover among it, it becomes a very troublesome business indeed, and it is generally used for packing by the nurserymen and wine merchants, or consumed by the stock in the yard; the average price of barley for the last three years is about 4*s.* which, with the offal and straw at 2*s.* more, will bring it to about £10 16*s.* per acre.

DESTINATION.—Whoever travels through this county and examines its very extensive maltings at Nine Elms, Battersea, Kingston, Guildford, Godalming, Farnham, Croydon Mortlake, &c. with the very capital malt distilleries at Vauxhall, Battersea, Wandsworth, and Kingston, the large porter breweries of Messrs. Barclay, Clowes, Holcomb, &c. together with the infinity of pale beer breweries in the Borough of Southwark, and dispersed through every town and village in the county, cannot be at a loss to account for the magnitude of the demand for this article. I confess I am not prepared to form any judgment as to the extent of the regular consumption among these several manufactures when all restrictions are taken off, and when each profession is at its ordinary employ; but I think I may fairly venture to say, that the growth does not equal even in the most favoured season perhaps the one tenth part of the demand.

The produce, as stated by Mr. King, of the whole kingdom was 27,000,000 bushels; Dr. Campbell in 1774, states it at 38,826,176 bushels in a common year; it is infinitely more at this time. The consumption in this grain in bread is computed at 8,120,000 bushels. It is allowed that those, who eat barley bread, eat one with another eleven bushels in the year, whereas people usually eat but eight bushels of wheat; this is very probable since barley commonly weighs but from 44 to 48 pounds per bushel. In 1764, the quantity of barley made into malt, and when paid to the excise, was 28,000,000; the quantity in 1802 was if to this quantity we add 10,000,000 bushels for fatting hogs, poultry, &c. which I think is below the mark, the quantity grown in England will amount to bushels, exclusive of that which is returned to the earth as seed corn.

The produce of this county, I am inclined to think, is about 640,000 bushels per annum.

Barley is said to be the first grain that was introduced for the sustenance of man, the cultivation of which was taught by the Goddess Isis to the Egyptians, according to Diodorus Siculus, and Plutarch. It was anciently made into bread and much esteemed in many countries. It was so even in this, and though now wheat bread very beer. There is also a very large consumption of malt by the distillers, who draw from thence amazing quantities of spirits, on which there are likewise very considerable duties. As these spirits are in every degree injurious to the constitution, the higher the duties the farther removed would be the danger. It is of no avail to be told that every quarter of corn consumed in the distillery pays above £3 duty to the revenue, if every glass that is drunk of the produce is hastening the drinker so much the faster to the grave; and as the learned Dr. Thornton truly observes, nothing can prove it more satisfactorily than the examination of the kidney's of a hog that has been fatted upon the grains and wash, when they will be found to be entirely destroyed.

By the returns of the excise office, it appears that the average quantity of spirits for which duty is paid in London alone, is 11,300,000 gallons; and the annual duty on malt up to the 10th of October, 1803, was £1,164,034 1*s.* 6¼*d.*

As the bran of wheat, so the dust of malt, is found by experience to be a most excellent manure, as may be seen under its proper head.

There is a practice among the retailers of malt which deserves to be noticed. When a poor person buys a bushel of malt, if he has no mill, the seller offers to grind it gratis, and he then measures out the bushel of malt thus ground, reserving the surplus for himself; this surplus is seldom less than one gallon or one eighth part of the bushel. Again, there are instances, where barley meal is made into bread, of the grossest impositions being practised by the miller; I have heard of its being done in this county and Sussex, but there was a conviction in Yorkshire, where at the quarter sessions held at Beverley on the 11th of January 1803, one Grey, a miller at Howden, was sentenced to one month's imprisonment, and to pay a fine of £10, for returning bad unserviceable barley mixed with oat husks, for good barley.

Every hundred quarters of malt produces about 2000 gallons of spirit, and 11,000 gallons of wash, which pays 16¼*d.* per gallon. Every quarter of barley thus consumed pays in duties at least seven guineas.

OAT, AVENA SATIVA.

Triandria digynia. Linn. Sp. Plant.

Of this grain there are no less than 34 distinct species, besides those several varieties which are cultivated by the English farmer. Of these species its other qualities not yet sufficiently ascertained.

Of the first four sorts, very large quantities are grown in every part of the county, as well in the inclosed lands as in the open fields; especially where the course is restricted to a three or a four course shift; and being of a hardy nature, they are in regular cultivation upon the chalk, upon the friable loams, upon the sands, and upon the clayey soils; in each of which its produce is commensurate with the condition of the soil. Of the latter sort it is at present so partially cultivated, and even that in such small quantities as to prevent any opinion being given of it, as an article likely to supersede any of the above established sorts; but it is getting very fast into fashion. Oats are for the most part sown after wheat, rye, beans, or peas, without any manure whatever being previously laid on. Sometimes, indeed, they precede wheat, as well as other crops, after the land has been marled, chalked, or limed. It is, however, extremely bad policy to let it precede or succeed immediately any white crop; but I am very far from agreeing with many modern agriculturalits, that oats of themselves leave the land fouler than any other sort of corn. I know that it is always held that it does, but that opinion is not well founded; because as it almost always succeeds wheat, among bad farmers, not only in this but in other counties, if the land was not very clean where the wheat was sown, and the oats follow the wheat upon one ploughing, which is another bad practice, and perhaps those oats not effectually cleaned, it is not to be wondered that they should have the reputation of making the land foul. To prove this position I will beg leave to ask, if land is made as clean and as wholesome for oats as it usually is for wheat, and a fine clean sample of corn, such as seed wheat generally is, is sown, and a fair plant arises, which is weeded in the same manner as wheat or barley, will any man then prove to me that these oats will make the land fouler than either wheat or barley? I trust not. The fact then is simply this, that oats are the cheapest grain that comes to market, their consumption is principally for cattle, and being but seldom very nicely cleaned for them, especially for their own consumption, the men acquire a sort of habit in dressing oats, whereby they become scarcely ever cleaned for sowing as they should be, and as other grain are; but were oats to be made into flour or malt, we should find that the disgraceful and shameful man-a measure argues a narrow pitiful malignant spirit, nor can the act be considered in any other light than that of the most depraved roguishness on the part of the out-going tenant. Every landed proprietor finds more or less of this spirit prevailing, every in-coming tenant expects it, and so it unfortunately fell to my share when I went to farming in Hertfordshire. As it was at Christmas that I took possession, and the winter corn sown, the whole farm was so foul and starved as to require the utmost exertion to cleanse, and no small judgment in finding out how and when to begin. We were constrained to sow some oats, and a field of 20 acres was fixed upon for that purpose; I therefore gave it two good ploughings and harrowings, which, from the manner of its being done, brought up some fresh soil, that to all appearance had never seen day light before, which being carefully pulverised and mixed, and the couch and other weeds having been picked off and burnt, we had some reason to have expected a tolerable crop, at least something more than the seed. The seed that I sowed came out of Suffolk procured expressly for me, and was as fine a sample as could be wished, and made perfectly clean; nothing could vegetate finer, nor promise a more reasonable crop, especially as the weather was favourable; yet before May was out, the leaves had turned yellow, the plants became sickly, and were observed to dwindle, and I actually did not get as much seed from the crop as I had sown, and that seed was starved; nor was the straw in any part of the field (except where there happened to be a greater portion of fresh soil mixed with the old, or the droppings and stale from the horses, or where the weeds being burnt, made some difference) more than a foot high. Indeed, if I had had any sheep, or could have procured any to have folded off this crop, notwithstanding straw was so great an object with me, I should have been strongly induced to have done it. Upon inquiry I found that the preceding tenant, after chalking the field, had taken three or four wheat crops, and then for the last seven years, during which time he was only tenant at will, he had taken as many crops of oats upon one ploughing, without one interval of rest, or intermediate crop, or a single load of dung being laid upon it. Its being therefore so foul, and consequently impoverished, was what might have been expected, let him have sown what sort of corn he would equally indifferently cleaned, and therefore the foulness cannot exclusively be attached to oats.

The only preparation that is made for oats in the edge with a snap plough, (in the eastern part) less deep than before, and if laid into bout lands, the former are split; it is then sowed by some, under furrow, by others upon the tilth, broadcast; the ground is then well harrowed, and by some farmers afterwards rolled, water furrows are then struck wherever they may appear to be necessary. Sometimes trefoil and rye grass are sown with oats; but seldom clover; whenever it happens that either of them is sown, it is always before the final harrowing is done, but not until the soil is sufficiently pulverized by repeated harrowing and rolling, which will necessarily require more or less repetition in proportion to the dryness of the weather, or the natural adhesiveness of the soil; if it should happen that these small seeds cannot now be sown, they may be harrowed in with a bush harrow, after the plants are come up, without doing them any material injury, if carefully performed and taken in due time.

Seed.—On the ley, and if the land is moist, black oats are usually sown, after the rate of four bushels to the acre. If upon the etch, and the soil dry, and sown early, 3½ bushels are sown; and from that quantity to five bushels, depending as much upon the season, as the quality of the soil, and the quality of the seed. I have before taken notice of the prevailing idea that oats make land foul, I shall just merely state what I met with, in corroboration of the position I have stated upon that subject.

In going across from Kingston to Westerham, through Ewel, Cheam, Bansted, Catterham, Godstone, and Oxted, for the purposes of this survey, during the two or three last springs, I saw them sowing oats at Mr. Broadbent's, at Mr. Killick's, at Mr. Logan's, Mr. Durand's, Mr. Lambert's, Mr. John Ashby's, Mr. Lucas', Mr. Russel's, Mr. Stone's, and some others. I stopped, made some inquiries, and examined the seed, and although some were more clean and free from the seeds of weeds than others, yet there was not one of them whose sample was not more or less foul. Upon some of the farms the seedmen told me, that the seed had been bought in by way of change, and that the sacks had not been opened before they were brought on the ground, with the exception of two or three, which had appeared to be as good as the sample they were bought by, others were of their own growth. In the first instance, as their masters always bought the best they could, they seldom or never perhaps cleaned the bulk after it came that in general their system of farming is unclogged by narrow prejudices; that their lands and stock are kept in high order, and that so far they exalt the character of that part of the county. I then further say, that if farmers of such established reputation, (and there are many others in the same situation in other parts of the county) are not always so nice in their seed corn, particularly oats, as they should be, what may not be expected from the slovenly, illiterate farmer.

To ascertain its quality for vegetation, the same remark will hold good here as with the preceding grain. I have tried them of different degrees of colour, at various periods, in pots, and in the natural ground, in the artificial heat of a tan bed, in a hot house, in hot beds under frames, and with various sorts of steeps, and I have invariably found, that every sort of tinge, tint, or shade, at the extremities of the corn, has ascertained such an injury, as to make it advisable to reject it altogether unless in seasons of unparalleled scarcity.

Steeping is never considered necessary for oats; it is therefore not to be found in the practice of any farmer in this county, nor in any other county in England, Scotland, Ireland, France or Holland, that I can learn, after a very minute inquiry.

Seed time.—Upon the leys they begin sowing as early in February as the land will permit. Upon the etch they sow all through the months of February, March, and April. There is certainly no good excuse for sowing oats so late as the middle of April, unless from an extraordinary wet season in March; but as that month is much more frequently dry than wet, and as an occasional wet time should only stimulate to greater exertions, I see no good excuse for delaying sowing of oats beyond the month of March; for the excuse is not to be admitted that a farmer could not get his land ready sooner.

No man ought to have more land than he can with every fair exertion get into order, so as to catch the first fair weather as the seasons come round. If his capital is insufficient to enable him to employ as many teams and people as will permit him to do it, or if the quantity of land he holds is above his compass of mind and spirit, in either case, he should take a farm more suitable to his capacity; for he will scarcely ever either do himself or his land any good if he is cramped in either of these points. I am led to say thus much, because when crops of oats have been sown in April, and dry weather has succeeded, which has caused them fault that attended them was there being too thick, which of course prevented the seed from being so large and fine as perhaps otherwise it might have been. Such a plan, however, as this is not to be recommended at any time, because it cannot fail of exhausting the soil very much, and throws the field too out of its season; a much better way would have been to have folded it off in April with sheep, and if not very foul to have brought it in for turnips or winter tares. The like circumstance I saw at Mr. Flint's, at Turner's-hill, on the edge of this county, who obtained a crop of 13 quarters to the acre, besides so much corn shed as to cover his land; he let them stand all the winter and fed them off in the spring: the land, an old meadow kept in high order. The weeds which mostly prevail among the oats in this county are charlocks, docks, thistles, marygold, a wild carrot, scandix or shepherd's needle, and in some the common red poppy, with black bents, &c. The first of these as being the most predominant have their tops cut off, as they generally grow faster than the corn; the docks are pulled up by hand, the thistles are hooked out with a hook or spud, and the rest are left to stock the land; even the charlock is too often left to take its chance of smothering the corn, or of being smothered by it.

As soon as the stalks turn yellow, as the grain feels hard, and the husks begin to expand, the farmer thinks it is time to begin to mow, (for it is only here and there near London that oats are ever reaped and sheaved,) they are laid in swarths, and left a few days on the ground for the dews to plump the seed; even a little rain would do them no harm provided we could command just the right quantity, and fine weather afterwards to dry them quick; they will also then thrash out better. Oats are very apt to shed, therefore care is usually taken to carry them as soon as they are fit, to prevent their scattering either by loading or by the wind.

Thrashing differs in no respect from that which is observed for barley. The price for the labour of it will be found under the article of labour.

Produce is from 25 bushels to 80 bushels; I am inclined to think that 44 bushels will average the county.

This grain is still used in making bread, but in no great quantity in this county. In Wales, over the great part of Scotland, and the north of Ireland, and more or less of it in every county in and great quantities of it are continually used at sea. But the principal consumption, more especially of late years, and particularly in South Britain, has been for the feeding of horses, being from experience found the wholesomest and fittest for that use, and as such it is become an object of considerable importance.

Oats are likewise given to sheep and oxen; to the former while they are at turnips, and other green meat, or while they are fatting upon dry food; and to oxen while they are also fatting. When green meat is very scarce, and grains not plenty, mashes of scalded oats are given to milch cows, which increases and improves their milk. Poultry are fatted with them, and they are given to hounds when ground and mixed up with scalding water, and pot liquor or grease.

Oats when malted and distilled, yield a very fine spirit.

It is computed that for the maintenance of horses, and for other purposes, there were consumed annually, about 30 years ago, 19,692,000 bushels; our whole growth then amounted to no less than 23,927,576 bushels; whereas Mr. King states the produce of oats in 1765, to be 16,000,000 bushels. But our usual consumption about 1774, amounts to 24,021,800 bushels, which is supplied by an annual importation of this grain, which has been evidently increasing ever since. In the year 1768, there appears to have been a great importation, which in oats and oatmeal, amounted to 219,310 quarters, or 1,754,480 bushels, which cost about £175,448. In the three years preceding 1794, the quantity of oats imported amounted to the enormous bulk of 842,229 quarters, or 6,737,832 bushels, which quantities have been increasing in the same or nearly the same ratio of importation to the present hour, as will be hereafter shewn.

In the reign of Queen Anne it would seem as if our growth exceeded the consumption, because we find a bounty of 2*s.* 6*d.* a quarter paid upon exportation, when oats were under 15*s.* per quarter, which we may suppose to have been the case, by the apparent necessity for this statute, which passed in the fifth year of her reign.

I have reason to believe that the quantity grown in this county, has for the last three years averaged per annum, 35,750 quarters, or 286,000 bushels.

BEANS. VICIA FABA.

Diadelphia decandria. Linn. Sp. Plant.

Of this genus there are several species, but as the as the garden bean is less hardy, more early, and not so productive in the common course of husbandry.

A great many beans are cultivated in this county, but unless it is about Walton, Thames Ditton, &c. where garden beans are cultivated for the London market, and consequently are always sown in drills, and in the neighbourhood of Guildford where almost every crop is drilled, this county does not derive so much advantage by the cultivation of beans as it ought to do; they are indisputably a clean crop, require a soil that is not lighter than a sandy loam, and from that through the gradations of friable, argillaceous, and calcareous loams.

It is not customary among ordinary farmers to manure for beans, but the more skilful ones give the land its accustomed dressing, drill in their beans, and follow with wheat, which, from the difference in the structure of the plant, and the difference in the nature of its food, fit the soil above almost every other plant for a wheat crop.

Beans are fond of deep holding soil made rich by dressing, and finally pulverized by frequent and deep ploughing and harrowing. If the soil is shallow and thin upon a rocky bottom, an over dressing will inevitably spoil the crop, of which I saw a remarkable instance at park farm in the parish of Beeding, in Sussex, in the year 1801. It was in a field of ten acres that had been manured highly for wheat, but the extremely high price of that grain tempted the farmer to sell it, and he sowed it with horse beans instead. When I saw them, which was in the harvest of that year, they were in full vigour and above six feet high; they yielded a tolerable good crop, but were scarcely ripe at Christmas; but in the next field, which had been sown with the same sort of beans upon a wheat etch, they did not exceed four feet in height, were ripening fast, and yielded above one third more crop. It was agreed by all parties, and there were several Surrey farmers present, that the field having been super-saturated with dung had spoilt the crop.

The only preparation which the land experiences for beans in this county, is, to plough the etch or stubble early in October, or at latest by the end of November, leaving it rough; and if the field is an old ley, to leave it smooth by turning the grass side downwards. According to the quality of the soil, and its general aptitude to be wet or dry, it is either ploughed into broad or narrow lands. Beans are almost uniformly, as I have said before, rows, and the beans being sown broadcast, are by some ploughed under furrow, and by others they are only harrowed in; if ploughed in, they do not require more than once harrowing unless the land is coarse and rough, and then it is rolled about a week afterwards. When beans are drilled, the ground is made tolerably smooth and level first, and the beans drilled in either by the machine or by hand. I am clearly of opinion, that in all cases beans should be sown in lines, and that the better way of doing it, upon all soils except the very heavy ones, is at the last ploughing to lay the land quite flat, to draw a shallow drill, say three inches deep, at two feet six inches row from row, either with a light Suffolk plough, or with a line and garden hoe, which latter mode, although not so expeditious certainly, and therefore not so cheap, yet is abundantly the truest way. There is many a Hertfordshire ploughman that can strike out these drills, nearly as true every way with his plough, as the most expert gardener can with his line and hoe; and where that happens to be the case with the ploughmen, it is a good way to do it. The beans are then dibbled in these drills which should be if possible from east to west, and the beans put into the north side of the drill; the ground ought to be deep ploughed, as equidistant as possible. As they break ground, they are sheltered from the cold March winds, and as they advance above the level of the ground, they should be immediately hand hoed, and the ridges of the furrow should be gently drawn up to the stems, which not only greatly protects them, encouraging their growth, at the same time that it cannot fail to strengthen them, and to clean the ground. I am aware that this is not the usual mode; because, when they are put in with the drill or with the line and dibble, there is no trace left of a furrow or drill, which appears to me to be the necessary part of their cultivation. When they are hand hoed, the way to do it most advantageously, is, for two men to be set at it, following each other close in different rows, the one man drawing the soil from the north or east to the plant, the other drawing the soil from the south or west, (according as the situation of the field may have caused them to be planted,) in the next row to the plant, by which means the plants are kept in their equilibrium, without being liable to be broke by the weight of the soil on one side, before there is any placed against them on the other.

The next hoeing may be with the horse hoe, quire a great deal of trouble to separate, they will almost as readily be bit asunder in any other direction, as down the middle. Again, as all beans are more or less kidney shaped, examine that part which is called the eye, and which is situated in the hollow of one side of the bean; by opening it there, you will see that part of the economy of the seed, called by the Botanists the placenta, perfectly clear and distinct from the bean; of a fresh and lively colour, rather greener than the other part of the bean, but with no tint or shade of red, you may then conclude that vegetation is so far safe. Again, when beans are cut down before they are thoroughly ripe, the seed will inevitably shrivel, and be less in size: the parts of fructification will in course partake of this prematurity, and they will be so far from being good, as a premature, weak, rickety child, is from having a sound constitution, or of being of a proper size.

STEEPING is more apt to rot beans than to do them any service; several were tried in various ways this last spring, expressly for the purpose of ascertaining this fact, some of which succeeding when dry weather followed, but almost invariably failed or rotted when wet weather succeeded.

SEED.—As the greater breadth of land sown in Surrey is broadcast, the usual quantity of seed sown per acre is from three to five bushels, depending as much on the soil as the season.

SEED TIME.—Upon the lighter loams, and in good situations, the farmers begin to sow as early in January as the frost will let them; this year on the 3d of January, many farmers were sowing in different parts of the county, and I found them sowing all through that month, the succeeding one, and until the third week in March, as fast as the dryness of the ground, and the season would permit them. It is always a precarious crop, from the time of their birth until they are housed; being first liable to be killed by alternate frost and thaws, and as soon as they are come up, to be severely checked by the cold piercing winds in March and April, and which possibly may lay the foundation for all the calamities that afterwards befal them, since it is no unusual thing to see the leaves and stem turned quite black with the coldness of that season. They are then liable to be attacked by the black dolphin in June or July, and if they escape all these, and appear ever so promising, yet a wet September, October, or November, will possibly entirely spoil them. When beans are old, they should be sown at least 15 or 20 days for-beans are four or five inches high; if these sheep are suffered to ramble over the field at leisure, during the day time only, they will pick up and eat the grass and weeds that may have sprung up among the beans, without doing them any or at least little injury, either by treading them down, or laying down upon them; but on the other hand, they will do infinite service to the land and crop, by weeding and manuring. This practice should be repeated every ten days, until the crop has got so high, as not to venture the sheep in among the plants any longer, because the chance of recovery is greatly against those which may be broken down. I have seen sheep turned among drilled beans, when they were in blossom, and they regularly walked up and down between the rows scarcely nibbling a plant, or attempting to cross the rows. The fact is, that the extraordinary bitterness of the bean is extremely ungrateful to sheep, and if perchance they bite off some of the heads, they will very seldom repeat it; but should they do it generally, when the plants are in flower, the advantage would perhaps be greatly in favour of the crop; because, it is a constant custom with the gardener to do it, in order to set the blossoms, which, without that precaution, are apt in particular seasons to fall off and become in their language blind, that is, not productive of fruit or pods. When such a plan as the latter is pursued, I should then recommend the beans that are drilled to be landed up, either with the plough or the common hand hoe, which cannot fail of rendering essential service to the plants.

One precaution seems necessary to be observed with respect to turning in sheep, viz. that they should not be turned in upon an empty stomach, but partially filled, which will somewhat restrain their eagerness for rambling over the ground.

Harvesting.—They are almost invariably bagged close to the ground, sometimes when hands are scarce, they are mowed with a common scythe and bound up by women, after which, if the weather is likely to be catching or wet, they are set up sometimes in four sheaves, at others in eight, at others ten, or the sheaves are collected together, and made into a round body, with some of them piled on the top of the others, so as to form a conical roof with the roots upwards, and the heads spread out so as to cover the tops and part of the sides of the under sheaves. In this way I have kept them safe for near seven weeks. The sheaves are generally bound with a part of the greenest of broke his thrashing machine, owing as I understood, partly to the increased force which they found necessary to use in separating the beans from the pods, and partly to the brittleness of the iron, of which the wheel was composed. The price of thrashing beans per quarter, will be found under the article of labour.

Produce depends more on the state of the weather which may have taken place during the season than either upon the soil or situation, although both undoubtedly have some influence on the produce. My accounts vary so much in the same parishes according to the difference of seasons, that to a superficial observer it would almost appear incredible. I have one account as low as seven bushels per acre; the following year upon the same farm, and about the same quality of land, in much the same condition, the produce amounted to 64 bushels. In the season of 1802, the produce was estimated at 5¼ quarters per acre. I have no other account below 16 bushels, but there are seven accounts above 72 bushels. Upon examining minutely the crop of 1803, I don't think that I dare average the county at more than 32 bushels, or four quarters per acre.

Consumption is principally confined to horses, to which they are given either whole or split, and in the latter state they are considered most wholesome and nutritive.

They are admitted to be a warm stimulating food, calculated for old horses, or those which work hard, and particularly during the winter months.

They are given to sheep that are at turnips in a morning, to prevent the rawness and coldness as well as the great quantity of succulent matter which the latter yield, from hurting them.

They are given to hogs also in quantities, especially when put up to fatting; but they are considered not to be so good as peas, unless, as the Hampshire and Berkshire people say, the meat is intended for bacon,

In my account of wheat flour, I have said that bean flour is often mixed with it; and that it is actually so, I have from the most indubitable authority. Indeed, I never heard that the millers attempted to deny it. I have often heard them parry the question, as the quakers do, by asking another, to the following purport, " pray is not bean flour as good as wheat flour? Can you point out any harm in it? Do not all ranks of people eat beans all the summer long by choice? Can the large quantities, to our plantations in the West Indies, where they are applied as food for the negroes.

Mr. King states the annual growth of beans in 1765 to be about 4,000,000 bushels, but this quantity must be considerably below the present consumption of the country; because, there has been a gradual excess of importation beyond the exportation, amounting in the three years preceding 1795, upon an average, to 20,141 quarters, or 161,128 bushels. The growth of the last three years cannot, I apprehend, have averaged less than 12,000,000 of bushels, of which this county has grown 30,000 quarters, or 240,000 bushels. All these circumstances tend more than any other, to shew the increased state of our cultivation, and without doubt, a wide extended population infinitely greater than at any former period.

PEAS. PISUM ARVENSE, ET SATIVUM.

Diadelphia decandria. Linn. Sp. Plant.

Of this genus there are only four species, according to professor Murray, but the varieties of those which are cultivated in the garden, as well as those which more immediately belong to the farm, are innumerable.

As peas form one of the course of crops in each of the best cultivated districts, they may be considered as grown in rather large quantities in this county.

In the sandy and loamy districts on the banks of the Thames, a great many are podded and sent green to the London markets; in some seasons several hundred quarters are grown for the London seedsmen, as seed. The preparation of the soil for either the garden or the field pea does not in the least differ, for they are generally sown after wheat or barley. The stubble having been cut very low, is ploughed in, and as clean turned over as possible, but the surface left rough. If the land is not in good heart, a light sprinkling of dung is carted on the land during the frost, or as soon after as possible; but in general the land is not dunged, because if it is in good cultivation, peas do not require it, or if it proves a dripping season, dung is found to make them grow rank and blind. After the dung is spread, the land is fresh ploughed thin and flat, and if a dry soil, it is not ploughed in lands at all; it is then well harrowed, drills are drawn by hand with a hoe and line at 24 to 30 inches distance, and the seed sown therein, rather thicker than if the season was later, on acwith the exception of manure, although some farmers are of opinion that the land should be first manured. Upon the hills the land is ploughed all one way, generally with the Turnwrest plough, and the peas are sown broadcast, water furrows are always struck. Upon the levels and stronger soils the land is laid up in three, four, five, and more bout lands, according as it is more or less inclined to be wet, by the snap plough. The first ploughing that it receives is shallow and across, and after the frost is gone it is well harrowed, and then it is ploughed its usual depth up and down; and in this state it remains for the sowing season; the seed is usually harrowed in, but some neat farmers plough deep the first time, then harrow just before seed time, sow the seed broadcast and plough it in with a shallow furrow, and if the weather is dry in a day or two, they run the light harrows over it which finishes the work.

I have met with so few instances where grey peas are drilled, except the district round Guildford, that they do not deserve to be recorded.

In this neighbourhood they use a small drill; with which they put in their peas and other crops, and upon those light soils it seems to answer very well.

About Bramley, Wornesh, &c. they used formerly to set their peas with a dibble, in the same manner as beans are usually dibbled, but they are all now drilled with the drill before-mentioned.

Sort.—For the markets we have the following sorts, and in the following order; 1st the early frame, or single blossom; 2d the early superfine Nicholas; 3d the early Charlton; 4th the golden

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hotspur; 5th the dwarf marrowfat; 6th the dwarf prolific; 7th the tall or large marrowfat; these with the addition of the blue union, the Spanish malotto, the green and white rouncival, the crooked sugar, dwarf sugar, and a few others, comprise the assortment that is grown for the seedsmen or nurserymen.

The sorts that are confined to the farmer, are the common white or boiling pea as the earliest, the Marlborough grey as the second, and by some the horn grey or hog pea, which is a large and late pea, well calculated for the strong soils of the county, although inferior to the Marlborough grey.

Steeping is never used as a preventive against insects or vermin; but very often in a scarce and dear season, and then those only which are known to be old, or judged to be so, or when the season and the ground are unusually dry. They are put into a gathered green, are begun to be sown in the open fields as early in January as the land will work, every ten or fifteen days they are repeated, leaving out the early frame after the first month, and continuing to sow during the whole of March, and sometimes through April and May, by which means, and observing the course of the podding of the larger sorts to succeed the first glut of the early sorts, a succession is kept up during the months of June, July, August, and a few in September, because after the larger sorts are done with, the early sorts sown in April and May, will again come in to close the season. But at some of the large market gardeners, such as those at Abbs Court near Walton, at Morlake, Wandsworth, &c. pease of the early frame kind are sown under walls, fences, and other warm and sheltered situations, as early as October, November, and December.

Grey pease are sown from the beginning of February to the end of March. In the spring of 1803, the greater part were sown by the end of February; I see no reasonable objection to the whole crop being sown this month, if the ground can possibly be got ready; on the contrary, I am persuaded that it is much the fittest time, as it gives the plants an opportunity of being firmly rooted in the ground before the dry weather sets in. The older the seed the earlier they ought to be sown.

Cultivation.—Whenever white pease of any of the kinds are sown in drills, they are carefully hand hoed between the rows, as soon as they are two or three inches above ground, not only for the purpose of destroying the young weeds that are just coming up, but to loosen the surface, to pulverize the ground, and to prepare it for landing up the pease at the next hoeing. The hoer ought to take particular care at this hoeing, not to draw the soil from the rows, but rather to them. Indeed many growers set their men to hoe them at the first hoeing in the manner I have described for beans, the men walking sideways, and so gently drawing the soil towards the plants, which skreens them very much, It is a very common practice in sowing them in drills, to leave the back part of the drill that is exposed to the north or the east, standing, and forming a ridge; and only cover the seed with the opposite side of the drill. This ridge is found to afford great protection to the tender plants in a cold March or April; and consequently very much forwards their growth. As soon as the pease begin to run, they are again crop more as it were under his eye, he is desirous of growing them at no great distance from London, because the sort may be what the seedsman sets great store by, (but which he keeps to himself,) and which the grower soon discovers by his anxiety and frequent visits. When they begin to pod, or the grower finds the market to be high, and money, perhaps, runs short, he begins to gather for market by regularly going over them once or twice, and gathers all the first pods; he then has them hoed directly to prevent the suspicion of their having been gathered. By having thus gathered the first pease that podded, the seedsman's views are in part frustrated, inasmuch as those pease are by much the most valuable. If the sort be really good, so much the more likely it may be that the seedsman never sees one bushel, as the bona fide produce of his own stock, delivered into his warehouse. It is soon known all round the neighbourhood, and at all the markets, that such a farmer has an uncommon fine sort of pea, it reaches the ears of the gardener, the nurseryman, and the seedsman, and each of them is anxious to have some of them, at any price; perhaps he may be tempted with an offer of one guinea per bushel, which he has not fortitude enough to resist; and therefore, rogue like, he sells the greater part, if not the whole of them, and buys another sort, as good as he can for 10 or 12*s.* a bushel, and sends them to the seedsman or nurseryman, as the actual produce of his own stock. Perhaps a more consummate piece of villainy cannot well exist. In order to preserve the purity and trueness of this favourite sort of pea, the seedsman's visits, with a careful servant that is accustomed to the operation, is principally with a view, as soon as they come into blossom, to go carefully over them, and pull up all those which appear less early, more rank, to differ in the colour of the blossom, or in any other respect to vary from the sort he means to preserve; (this is called roguing them,) and in this way he continues from time to time to eradicate every spurious plant, until he is satisfied with the quality of the remaining stock. This is more or less the practice of every grower in the county. When these peas are delivered to the seedsman, upon a presumption that he has been honestly treated by the contractor, he deals them out among his particular friends and customers with a sparing hand, is lavish in their praises, and he charges accordingly, when lo! instead of their turning out what his customers expected, and he fully in-

The grey peas sown broadcast, receive no other attention than once, or at most twice, cutting out the thistles, &c. and pulling up the docks.

HARVESTING.—Those peas which are intended to be gathered green, and for market, are sometimes sold by the acre; but in general the farmers choose to gather them, for which purpose, they have always early applications from the podders in their own neighbourhood, and from itinerant Welsh women, who now appear in droves, soliciting this busy and cheerful employment.

They are gathered by the basket or sack of four bushels. From 25 to 30 people are employed in the proportion to seven acres. The carts or boats that take this produce to the London markets, are loaded and set out in the evening, and during the night, in order that they may arrive at market between the hours of three and six o'clock the next morning, when they are delivered to salesmen, who sell them out in lots to the green grocers, and to those who cry them about the streets.

If the sort is good, they will bear picking over three times well; those which are not gathered are considered to be spurious, and not worth the saving, therefore the haulm is hooked up immediately, and carried to some dry place and spread out, sometimes it is laid upon hedges, or low buildings, either to harvest for cattle, for covering of radishes, or such like early crops; or to sell to the nurserymen for packing; and the land is immediately prepared either for turnips or for wheat.

The peas that are grown for the seedsmen, as well as those which the farmer may grow on his own account, are of course not harvested until they are ripe, when they are hooked; but those belonging to the former are often pulled up by the hand, and frequently under his own eye, in case they may want an additional roguing. They are collected in rows or ridges, turned over once or twice, until they are dry enough, when they are carried to the barn, or to the rick yard, and there stacked.

THRASHING.—As soon as the contract peas are housed, and have laid about a fortnight or something more, depending generally upon the approach of harvest, they are thrashed out by the flail, as are in general all the other sorts. The price for the labour of this operation will be found under the article of labour.

PRODUCE.—I think of the early peas of different sorts the average produce per acre in the county will be full five quarters, of the other sorts about four quarters, with the exception of the sort of pea is good, the price of which is never regarded, when it is near to water carriage, and the land suitable to them,) that I have no doubt of their producing £20 per acre; but as all land where they are grown, cannot be so circumstanced, I think they may be averaged at £16 per acre.

CONSUMPTION.—Very large quantities are annually consumed in a variety of ways in our kitchens in town and country, and that consumption is found to increase every year: immense quantities are sent on board our ships as sea provisions, a considerable proportion is devoted to the use of our hospitals, infirmaries, workhouses, and other charitable establishments; and it has been said that more than all these together are consumed in the fattening of hogs and sheep, the latter, however, take but an inconsiderable quantity, and therefore I give no credit to it; however, there is always a constant and large demand.

Mr. King states the annual growth of the kingdom for some years previous to 1765, at 7,000,000 of bushels; for the three years preceding 1795, we annually imported 3,445 quarters, or 27,560 bushels, and during that period we had exported principally to our colonies, 6,083 quarters, or 48,664 bushels; during the last three years, we have imported 81,633 quarters, or 6,53,064 bushels, and exported 5697 quarters, or 45,576 bushels. I am of opinion, that for the last three years there have not been less than 18,000,000 grown, upon the average, in the kingdom, of which 45,000 quarters, or 360,000 bushels are the produce of this county.

TARE OR VETCH. VICIA SATIVA.

Diadelphia decandria. Linn. Sp. Plant.

According to Professor Murray, there are 18 species of this plant, including the bean. Of the plant we are now treating about, there are three varieties, the winter, the spring, and the white tare. They retain their distinct properties so correctly, that we can be at no loss to establish them; because, in the first place, they each require a totally different management; and secondly, because the two former are black, and the other white seeded.

If we refer to the works of that celebrated English author Philip Miller, we shall find him state, that after sowing for many years the common vetch or tare, which is much cultivated in the fields for fodder, he seems to think that the sort upwards of 60 years ago, evidently proves that the intrinsic value of tares, as food for cattle, was as well known in those days as at present. Du Hamel, who wrote in 1760, gives a very full account, both as to the mode of cultivation, and the application of them, as fodder, cut green, and given to oxen and cows; and also reserved for winter fodder. In the southern provinces of France they sow the vetch, he says, before winter, because it bears the frost pretty well, yet in our provinces, which may be called the middle provinces, they sow it on the spring corn lands, which have been winter fallowed, and have had a second ploughing in February or March. If the tares are to be cut green, they generally mix a certain quantity of oats among them, which save them from the ground.

In looking into some old books of accounts belonging to my father, I perceive that in one year particularly, viz. 1757, there were sent to the following persons, the quantity of tares specified below.

July 5, 1757.	Sent 36 bushels of winter tares to R. Rigby, Esq. by Manningtree vessel.
12,	28 bushels of ditto, to Lord Orwell, by Ipswich vessel.
16,	32 bushels of ditto, to Lord Petre, by his own waggon.
19,	24 bushels of ditto, to Lord Piggot, at Ealing, by his own cart.
23,	44 bushels of ditto, to Rich. Vernon, Esq. Newmarket, by Archer.
25,	18 bushels of ditto, to Col. Burgoyne, at the Oaks, by his own waggon.
—,	30 bushels of ditto, to the Earl of Hertford, by the Sudbury waggon.

July 25, 1757.	16	bushels of winter tares to the Earl of Oxford, by Leominster waggon.
Sept. 29,	24	bushels of ditto, to Hans Stanley, Esq. by Southampton waggon.
Oct. 27,	20	bushels of ditto, to Lord Northampton, by East Bourne waggon.
Total	272	bushels.

There are several smaller quantities sold to other gentlemen, which I did not think worth while to enumerate. The year 1755 appears to be the first period that they were sold by my father; and the quantities sold to most of the above personages were about two-thirds less. The books of the next year, 1756, I could not find, but I should apprehend that the quantities had somewhat increased. In the years 1759 and 1760, the same quantities were sent to the above noblemen and gentlemen, say, but as long as I can recollect matters of business, which is above 30 years, Mr. Oldman, who was at that time steward and gardener to the late General Burgoyne, at the Oaks, near Carshalton, most certainly introduced them as such upon his farm, both for sheep feed, as well as for soiling of horses and cows, and also grew them for seed by contract for my father for several years. How far other people can claim an exclusive merit in the introduction of this plant for agricultural purposes, when there are so many authentic documents of above half a century standing, to establish a priority of claim, I am at a loss to determine; since, almost every fact that is now known, and that was thought worthy of record, appears to have been well known to the authors above quoted, and to have been communicated by them. Even Columella, and Pliny, lib. xviii, strongly recommend them to be raised in a variety of ways.

In the preparation of the soil for this plant, it appears that the recommendation of Miller, Du Hamel, and other old authors, is with very little exception the practice of the present day; it must, say, they depend upon the quality of the ground. If the land is wet or moist, the ridges are made higher and narrower, and it has two ploughings. If the land is sandy on a dry loam, the ridges are made broad and flat, or it is not made into ridges at all. Thus it is in this county: After peas they are sown upon the furrow after once ploughing, and are harrowed in. If upon the wheat etch, after the stubble has been cleared off, the seed is sometimes sown and ploughed in with a shallow furrow, at other times the etch is ploughed in, the seed sown, and then harrowed; but in all light sands it is considered the better practice to plough in the seed, and, indeed, this last season has fully confirmed the superior advantage of it, because great part of many of the crops in different parts of the county that had been harrowed in, were forced, or as it is termed, spewed out of the ground, and by that means destroyed, when those which were ploughed in had got such effectual hold of the ground as to have remained secure.

Steeping is considered to be only necessary in the event of the seed being old, and it should then be treated in the same manner as peas.

SEED.—The usual quantity of tares sown is from two to three bushels, the forwarder the season the newer and fresher the seed, and the better the quality and condition of the land, the fewer seed is necessary, and the contrary of all these the

Again, whenever new tares fetch 21*s*. per bushel, if there are any old seed in the kingdom, you may rest satisfied that one half of those at least which are sold as new tares are not so, and the more jobbers' hands they may go through, the oftener they will be married.

Seed time.—I do not find that winter tares are sowed before the first week in September, and they are continued to be sown every fortnight upon the large farms, all through the month of October to the middle of November.

The spring tares are sown during the months of February and March.

The white tare, of which I have seen a great many growing this season in Ashdown park, were sown in the autumn, stood the winter well, yielded a great abundance of excellent spring fodder, and those which were reserved for seed were very productive.

The cultivation of tares is, perhaps, the most simple of all rural operations, being sown broadcast in every part of the county, (except at Send and Woking, where they are drilled and regularly hoed,) and in general covering the ground pretty thick in the spring, they in course admit of no hoeing, but as they are often obtained very foul from the seller, and very imprudently sown in the same state as they are received, without any other or further cleaning, they not unfrequently contain an abundance of wild marygold, cockle, docks, &c. they are sometimes weeded by the hand, and left as clean as possible; but if they are designed to be fed off, they are very seldom weeded under a persuasion that the sheep will destroy the weeds before they have time to perfect their seeds.

Indeed, when they stand for a crop, the prevailing opinion is, that they smother the weeds by the closeness of their growth; this is a mistaken idea as to the full extent of the matter, because docks and other root weeds have been found sufficiently strong in the ground after the crop was carried, to occasion a great deal of trouble. Upon every soil that will admit of the drill, they should be sown in that way and twice hoed, the land will then be left clean, the plants will be greatly strengthened, and a great deal less seed will be requisite.

HARVESTING.—If the weather proves mild at the end of March and the early part of April, and the plants have not been checked by a severe winter, the early sown winter tares will be ready upon kind land, to be fed off by the first week in May; although I have seen sheep at fold upon them in any in the field unconsumed, because it destroys the system and order of a farm, which should never have but one sort of crop in a field, unless that field is very large. Whenever tares cannot be consumed on the land in due time by the stock of the farm, I should be much inclined to follow Mr. Ashby's plan, which was either to buy in, or to take in sheep at a certain price, per score, to be soiled with the tares. Sometimes, I find they are made into hay, but that only happens when a sort of blight has seized the blossom, or when the land, from being over rich, causes the plants to grow too luxuriantly, and the blossoms to run blind; or when owing to very dry weather they become stunted in their growth; in either of which cases, if they are cut in time, and properly attended to in the curing, they will make a lot of extraordinary good hay.

Those which remain for seed, when ripe enough, are generally mowed or hooked, laid into rows, turned over two or three times, according as the weather may have suited, carried home and stacked.

Wet weather makes sad havock among them, for the frequent turning and drying them opens the pods, and perhaps more than one half is lost, in which case they ought to be suffered to grow for a crop, otherwise they would spoil any sort of grain that may happen to follow them immediately, as I have too frequently witnessed, and particularly in a crop of peas which were nearly destroyed by the tares that grew among them.

THRASHING.—This operation is almost, if not entirely performed by the flail, even where there may be a machine; the price of which, per quarter, will be found under the article labour.

Produce.—From five to 44 bushels per acre; I have not been able to learn the quantity of hay which an acre made green would average, but if I may judge from some experiments, as well as other circumstances, it must be above two tons. I grew 30 acres one year, and made one field of five acres into hay, but the land was poor, very full of thistles, and otherwise very foul, and I had reason to think that the seed was very much mixed, because they did not come up even, my crop was therefore, perhaps, not a fair criterion; such, however, as it was, it yielded about two tons per acre. The seed I sowed cost me 14*s.* per bushel, those which I saved from them that year happening to prove very plentiful, they did not sell for more than 2*s.* 6*d.* per bushel. I have sold many a bushel for a guinea, the last time was, I think, in 1795 or 1796, but I do not think that they have provoke, I have, to my astonishment, gone into many a cowhouse and stable, and seen all the cattle standing upon the bare stones or floor, while the urine was soaking into the ground, or running through a hole into the yard, or what is nearly as bad, running into the farm yard, already, perhaps, sufficiently saturated, and consequently in the two first cases, it becomes lost, and in the last unnecessary. In folding off tares, it cannot but be evident to every one who pays proper attention to the subject, that the hurdling off a certain quantity of them every day, and turning the sheep into that part so hurdled off, is not the way to consume them to the greatest advantage, nor of soiling the land so effectually as it should be; because the sheep in their eagerness to get at the fresh feed run over them, trample down a great many, soil many, and consequently much of them are spoilt. In the Essay on breaking up of Waste Lands, for which the Board of Agriculture did me the honour to vote me the medal, I stated a mode of feeding off tares, which I had seen practised with great success, which was in the following way: a set of rack hurdles were procured, which are similar to what we call wattles with five rails, the third bar being left out, upright bars are nailed to the bottom bar, and to the fourth bar, sufficiently wide to admit the heads of the sheep between them. But a better wattle I met with at Effingham, it is of the same size with the common wattle, the second bottom bar is left out entirely, and the third and the bottom bars being made stouter, have four fixed upright bars resembling rollers to a hay rack, and three upright rollers which turn round upon gudgeons or pivots, and which are the centre rollers; these rollers are secured in their places by holes made in the two cross bars, into which the gudgeons are placed. There are also some spare holes made in the two cross bars, to set the three moveable rollers wider or narrower, according as the size of the sheep may require it: the upper one of these two cross bars takes out, a grove being made in the two heads of the wattle to admit of it, and it is secured in its place by two pieces of wood or wedges drove in tight. These kind of wattles are intended to accommodate lambs in folding; I therefore should propose in making wattles for old sheep, that each of these rollers be made to turn round as a guard against any injury to the sheep. The mode of feeding them would then be thus: a swarth of tares being mown across the land, a sufficient number of these wattles, allowing one to

The haulm from tares which have stood for seed, is generally put into the racks and cribs for horses and stock, but being so dry and hard, neither the one nor the other are very fond of it; but if cut in full blossom, in fine dry weather, and made into hay, got up well, neither too green nor too dry, all sorts of cattle will feed upon it voraciously, and it becomes then a very hearty and nutritive food; but if on the contrary it is got in at all wet, the haulm turns mouldy, and it is only fit for litter. Mr. Miller has proved the good effects of the seed when given to horses, either with or without beans among their ordinary food, and he conceives them equally warm and wholesome. Pigeons we know are extremely partial to them when well ripened, but they are observed to drink frequently when they feed upon them, indicating thereby that they are of a very warm or hot nature. Tares when badly ripened or harvested in wet weather become soft and mouldy, and in this state even pigeons disdain to eat them, and I know of no use for them since I do not find that any animal will touch them.

The Dictionarum Rusticum says, that white tares serve better for meat than physic, being very nourishing, apt to loosen the belly and to provoke urine; but when eaten in great quantities fresh, or ill boiled, they beget many superfluities in the body, and are hurtful to the reins and bladder.

In the light lands of some parts of the county, it seems to be agreed by many of the farmers that tares leave the land foul, and that they do not come off sufficiently early for a crop of turnips to succeed as a cleansing crop; there are others also who assert, that wheat does not succeed well upon these lands after tares. In answer to the first I take it for granted, that if tares are sown perfectly clean, they cannot foul land more than wheat, or any other crop, and inasmuch as they are an effectual smothering crop, they must when they are fed off leave the land clean; and although they argue that buckwheat is better, yet I think that every day's experience proves the reverse. As to the second, I am convinced that it must arise either from the seed having been sown much too late, to the poverty of the ground, or to having suffered them to stand too long before they begin feeding them.

With regard to the third and last point I am of opinion, that if tares are fed off early, and the land receives two (but three would be better) good tares, and leave the land fit with proper tillage to carry a crop of wheat again the next year. But this mode of cultivation can only have relation to the ancient stile of agriculture, because, according to the present system, no routine can well be worse, and which indeed is sufficiently proved by the shortness and badness of those crops.

I have great difficulty in satisfying myself as to the growth of tares in the kingdom, if I were to hazard an opinion, it would be that they amount to 800,000 quarters, or 6,400,000 bushels; but the growth of this county at 12,500 quarters, or 100,000 bushels is, according to the best accounts I can collect, near the mark in a favourable season.

TURNIP. BRASSICA RAPA.

Tetradynamia siliquosa. Linn. Sp. Plant.

Of this genus there are 24 species according to Wildenow, including the turnip, of which there are the following varieties cultivated by the English farmer and market gardener, and which are generally sown in the following order: the early Dutch, the Swedish or yellow, the tankard, the Norfolk, the Hertfordshire white round, the red round, the green round, and the French or German. Of these the early Dutch, and the French or German are confined to the market gardener, all the other sorts being to be found upon one or other of the farms in this county.

The Swedish turnip is by much the hardiest turnip known, the most frequent fluctuations of weather, however severe, are found to have but little effect upon it, when all the others are entirely destroyed by the alternate changes of frost and thaw. It has also the superlative advantage of being much later in the spring, before it begins to run, than any other sort, enabling the vigilant farmer to prolong his winter feed until his first rye or winter tares are sufficiently forward for his sheep. This sort has not been many years introduced into the country, particularly as an article suitable to the farmer; it has however fully justified every encomium with which it was ushered into the kingdom. Notwithstanding it has established its fame for hardiness and sweetness, *it is* nevertheless surprising, that it has not yet found its way into every sheep or stock farm in the county; some object to it, because they say it is hard, and that lambs and old ewes cannot bite it; others having always sown it too backward, say, that it comes to no size, and others that the seed is too dear, which reasons shew too plainly a con-time. It does not yield so many leaves, but a much greater proportion of root to the acre than any other sort.

The Norfolk or Suffolk turnip is more oval or pear shaped than any other sort, grows to a large size, is very sweet, but is not so hardy as the white round, it is much relished by cattle, but should be consumed before Christmas, because then its leaves are very large, fresh, and succulent; the root grows partly in and partly out of the ground.

The Hertfordshire white round is so far distinct from the preceding sort as to be very easily characterised. It is a very flat, very round, and a very large turnip, more hardy than the preceding, and in some soils and situations than the next preceding sort also, because the roots are more deeply inserted in the ground, consequently are more protected by it; they may therefore be kept through the winter with as much safety almost as the red round, but it will not keep so long in the spring before it runs to seed. It is very sweet, peculiarly calculated for cows; large quantities of which are every year grown in this county for the cowkeepers on the north side of London. This sort is very generally mistaken for the green round, especially when grown in small shady inclosures, and under trees, because then it becomes very green at the top of the root. But the true green round is very distinct in its character.

The red round is in shape like the Norfolk, and like it too grows very much out of the ground, it arrives to a very large size, with handsome spreading succulent leaves. The external colour of the root from the top to the middle is a beautiful red, and gradually sinks from thence into a clear white to the top of the root. It is a very sweet turnip, considered by some farmers in certain soils as the next hardy to the Swedish; but my own experience does not confirm that idea, as I have found in a field where white, red, and green had been sown promiscuously, that the latter had stood when nearly the whole of the two former had been destroyed by the frost. Though they generally keep longer than the white sorts they are apt to become hard, spongy, and stringy.

The green round is shaped like the Hertfordshire white round, but never arrives to so large a size; its skin is thinner when large than any, except the early Dutch; its leaves are large and spreading, but more indented than either of the others; it is equally succulent, and some think more palatable. The roots do not grow so much under which he is most likely to have the greatest occasion for such particular sort, by so doing, he will have the greater chance of saving more roots in a severe winter, than if he had confined his entire growth to one sort; and he will find also that the change from one sort to another, small and trifling as it may appear to us, will be particularly pleasing and grateful to his stock, and thereby tend greatly to facilitate their kind feeding and fatting.

Among the best appendages of every farm, we may truly and very deservedly rank the turnip; its food is highly nutritive to man and beast, and as a preparative of the soil for the successive growth of corn, it stands at this day in the first class. No man who has a soil that is not too obdurate and wet, but makes a course of turnips one of his ameliorating crops; he considers the cultivation which they require, and the improved state in which they necessarily leave the soil, especially if they are fed off upon the land, as one of the greatest discoveries in the rural art, and as a certain road to his future prosperity; but notwithstanding which, such is the situation and the state of the greater part of the county, that for its size and capability I may say, I believe, that fewer turnips are grown than in almost any other corn county that I know. In the first place we have a large tract of land lying very wet and saturated from extreme ignorance or inattention; we have next a great deal of common field, every inch of which is almost peculiarly calculated and adapted to their growth; but which cannot be done on account of the very barbarous system therein usually pursued. And lastly, we have so large a tract of wastes and heaths, one half of which would grow turnips, but which is now lost, that it almost outrages our feelings. By a careful attention to the growth of a due proportion of turnips, tares, potatoes, carrots or parsnips, and cabbages, a farmer may, in all soils that are properly managed, fat more stock, and keep his farm in higher order upon a given quantity of land, than on the best meadows that have yet been known; even Sedgemoor in its highest luxuriance, and on which on a summer's day I have seen thousands of animals grazing; nor the fine vales of Aylesbury, Evesham, and Glamorgan, the Essex, Romney, or Pevensey marshes, rich as they undoubtedly are, can vie with this sort of feed for quickness in fatting. Nor can we expect to reap our full quantum of advantages by the growth of these articles, unless Parliament, in its wisdom, shall hit upon some plan for passing a general act, sensible, by reasoning which they could not deny, that it would encourage the size of the root, yet that rigid adherence to old customs which still exists among those of the old school, would prevent them from attempting it. I know of but one reason why farmers are so addicted to broad cast sowing and to shallow ploughing, and that is, the greater ease, facility, and dispatch of the work, to which I may add, perhaps, the little interest which many think they have in the soil. With respect to the broad cast system of sowing turnips there is but one way, and one sort of soil in which I could be induced to admit of it, and that is, after the land has been deep ploughed, well manured, and got into a fine mellow condition; then to begin shallow ploughing at four o'clock in the morning, while there is a strong dew upon the ground, and to lay the furrow quite upon its side, leaving a drill between each furrow; when the seed is sown it will naturally fall into these drills; the land being then immediately harrowed across, will leave the seed deposited about two inches deep; while in the usual way of harrowing in the seed, it is not buried more than one inch, some seeds not half an inch, and some are not buried at all, but remain on the surface, and others very nearly so, to take their chance, and hence, in dry weather, those seeds that have produced plants, soon shew themselves, for the plants become checked, and the fly (if it must be that insect) immediately attacks them; whereas when deep sown and covered, there is a greater chance of their obtaining moisture, and they can at any rate longer resist a severe drought.

In the case of some fields of turnips which I saw at Ades in Sussex, the seat of Robert Burnet Jones, Esq. in the summer of 1801, I think they were drilled on the land that had been laid quite flat by the harrow, but then the plants had been first horse hoed, and then after a few days, when the weeds were withered and dead, had been earthed up by the plough, so that they looked like a row of celery which had been landed up by the gardener. They were much the best I saw through the season, and as good, I think, as I ever saw in my life; and they indeed appeared the more striking, as there was an uncommon failure that year throughout the kingdom, and particularly so in that county, where there were scarcely any to be seen. This convinced me, therefore, that while his neighbours on every side had lost each of their repeated sowings that had been put in broad cast, that the weeds should have none; but I have strong doubts as to the general policy of the measure; for in the first place, the soil which covers and which is on each side of this dung, instead of having its parts separated by, and incorporated with, the particles of the dung, is a mere caput mortuum compared with the other: the furrows wherein the dung is lodged, is also a collector or receiver of all the moisture that falls, it swells and heaves up the soil, makes it lighter, and thereby liable to be injured by drying winds, the sun and air; the lateral roots are also confined within that furrow, which serves as two side walls; indeed, it is not to be supposed that they will be likely to push out sideways, and with far stretched roots seek the genial influence of the sun and air, while the active principles of nutriment are immediately underneath them; upon this principle, therefore, the roots will not be so large as in the usual way of dispersing the dung. Again, in the second place, supposing the turnips to be fed off upon the land, I am not clear that a great portion of the urine from the sheep would not be drawn into these furrows on account of the superior looseness of the soil, (and it is well known that sheep at turnips void an unusual quantity of urine;) if it is so, it would make that land so rich, that no after ploughing could remove and thoroughly incorporate the soil that lay between these ridges, making thereby one part of the succeeding crop more rank, and more likely to fail from it than the other. When the dung is uniformly spread over the ground, supposing those plants to be sown in rows at two feet six inches asunder, which

I think, was the distance at which Mr. Jones's were sown, every time the plants are landed up, they receive not only a fresh addition of soil, but a fresh acquisition of good soil, as intimately mixed and incorporated with manure as that in which they were growing; consequently, while the landing up adds to the looseness of the soil it increases their quantity of fresh food, and must be far better than the partial manner of putting the dung in the furrows only. I reason not from any experience with turnips, but I ground my doubts upon many a trial with various sorts of earths upon different plants; for we know that if we dig a hole in a given soil, not actually fit for the plant yet not entirely disagreeable to it, fill that hole with a composition of soils that are so perfectly agreeable to it as perhaps may force its growth, the plant that is put into such a hole will thrive very fast, with superabundant moisture, nor more exposed to drought by its extreme looseness in one part than in any other part of the same soil. I look upon the proper cultivation of this vegetable, and its consequences, as the sine qua non of rural economy; whatever tends to throw any new light on its cultivation ought to be carefully attended to, and as cautiously examined.

A winter and spring fallow is the preparation under which the land goes before it is thought to be in a condition for turnips; when the usual routine of crops have run their race, and the land becomes thereby more or less foul by a repetition of white crops, in November or December the land is ploughed up rough, and it is left thus exposed to the winter's chilling blasts and the frost's searching powers, to destroy the roots of perennial or biennial weeds, and to fit the soil for that sort of pulverization which is so necessary to prepare it for a crop. As soon as the season will permit from the more pressing object of spring sowing, the land is first dragged, it is then cross ploughed deeper than before, and left. If manure is scarce the fallow is folded, if otherwise, it is dunged, but it is first harrowed down, and the weeds collected and burnt; and after receiving such a dressing as the farmer thinks proper, or can spare, it is ploughed in, and which is just before seed time. It is then rough harrowed, the seed sown broadcast, covered with a good harrowing with the small harrows, and oftentimes rolled immediately, but sometimes not for some days. In some situations and soils the work is completed by striking proper water furrows, in others they are thought not necessary. Upon our hills the land is seldom laid up in ridges; in the levels about Charlwood, Burstow, Horne, &c. the fields are usually laid into four bout lands, at Effingham they are in five bout lands, and about Guildford, Bramley, &c. in six, seven, and eight bout lands.

STEEPING is not thought to be necessary by the most experimental or the most cautious farmer, nor have I the least idea that the most nauseous drug or preparation into which the seed may be put can communicate that taste to the leaves sufficiently strong (if at all) to prevent them from being attacked by insects. And to put the seed into any liquid for the purpose of insuring a quick vegetation only, I am of opinion that a much safer way is to sow it a week or two earlier.

SEED.—Perhaps no article for the appropriation of the farm (clover seed excepted) undergoes so (if he is attentive to his crops) to thin out in every fair season. But if this seed passes afterwards into the hands of the jobber, and through him to a farmer, who observes nothing but the mere practice of mixing, the chance is great indeed if a good crop ensues; for a great difference arises in the quality of the seed by the effect of a wet or dry summer, and a wet or dry harvest; and this, perhaps, is more to be dreaded than its passing through the hands of a combination of jobbers, for I have saved seed in a kind dry season which has kept sound and vegetated well at four years old, when seed one year old, saved in a wet season, that had not ripened well would scarcely grow at that age. To distinguish these, therefore, the following appearances have occurred to me to be a criterion.

In looking at various samples of turnip seed, it often happens that they are found to be of three, four, or five colours, green, green and yellow, green and red, green and black, and all these may come from the same ground, in the same season, mixed together. In cleaning them for sale they are all so much heavier than chaff, or any other extraneous body that may be found among them, that they will not separate in the best winnowing machine, or with the fairest wind that ever blew, and which, indeed, is the best way of cleaning them in fine weather. Now upon compressing and examining the green and yellow seed, it will be found to contain but a small quantity of vegetable oil, and must be considered as the unripe seed; it will, however, grow, but like every other immature thing, after vegetating, it feels the want of a sufficient body, and comes to little or nothing; the red seed would be the true vegetative seed, for having passed from the immature to the ripe state it should have been the seed fit for sowing; but that is not the case, for that seed having either been heated in the mow, (if it is not thrashed out as soon as it is cut,) or having been put into bags damp, or before it was thoroughly dry, has changed its dark, clear, black skin, for that of a dingy red, and if more closely examined, it will be found to smell and taste musty; upon compressing it, the oil that is found in it will be less clear, and not so strong as in the black seed, and however slight the degree of heat that may have caused this change of colour, we may rest assured that the vis vitæ is destroyed, and in course will render it more useless than the other sort. The black full bodied seed, although we may suspect it to be the siftings of rape, to grow; this is an infallible guide, and has saved me a crop of turnips two or three times, for I have often known the season and the fly charged with the cause of a loss of a crop, when in reality it was the defect in the seed only.

From one pint to two pints of seed is usually sown per acre.

Seed time.—June, July, and August are the months generally chosen, but as that ought to depend upon the quality and situation of the ground for bringing them forward, the purposes for which they are intended, and the ability to get the ground ready in due season, I will beg to say a word or two from my minute book on this head. If the ground is cold in its nature, and slow in communicating its vegetative powers, however well it may be mixed with dung, and if this crop is intended to be fed off as a preparative for wheat, the Norfolk turnip should be sown early in May. If the tankard turnips are intended to be landed up to come to a large size, they should be sown in May; but at farthest, and on no account (unless, indeed, the land is a hot-bed,) later than the first week in June. I tried them upon the same farm three successive years, and found those which I sowed after the month of June never came to any thing like the size which those did that were sown in May, and the early part of June, for I see, by my diary, that on the 14th of June 1797, I began to sow tankard turnip, and continued sowing it every day as fast as three ploughs could get the ground ready, until the 14th of July, when the whole of that sort was sown, and the ground finished. On the 14th of May 1799, and the 14th of May 1800, I sowed the tankard turnip every other day for two months, and found that those which were sown in May, were in the month of January following worth two acres of those sown in July. Another advantage arises from this early sowing, which is, that the soil is more moist, the heat less intense, and the plants less subject to injury by insects. But for those who have large farms, and keep large flocks, it would be impossible for them to get land enough sown in due season, if it was deferred so late as July before they began to sow. It appears, therefore, that to sow in July and August, which I saw practised by some of our farmers this and the last season, is too late; and their crops which I expressly examined in November and December of both years proved, that the bulbs would not be larger than a middling nonpareil; and it must be confessed, that the autumn of 1802 was as fa-

Cultivation.—As soon as the rough leaf is regularly formed, and the crop appears thick, some of the farmers run a harrow over them, drawing it one way as straight as possible; this loosens the soil, tears up a great many plants, and prepares the crop for hoeing. These are left some time to wither and die, while the rest will in a few days be recovered. As soon as they are found to be regularly set, they are hand hoed, the men thinning out the plants, and leaving them from 14 to 18 inches asunder, as near as may be; they cut all the ground clean as they go, which is done by drawing the hoe steadily towards them. In about two or three weeks, sooner or later, as the season and soil forces the plants forward, they are hoed over a second time, the hoer carefully singles out every plant, cuts the ground clean, and then leaves them; they are sometimes hoed a third time, when the crop has been found too thick, or when the land is very foul.

The expence of these operations will be found under the article of labour.

The value of an acre of turnips must be variously considered. In the first place, it must depend in a great degree upon its distance from the metropolis; secondly, whether they are consumed on the ground as they grow; or from wet, or from other causes, they are obliged to be drawn to be given to the stock in some other field, or for stall feeding in the house.

Within the distance of 12 or 14 miles, they are bought up, if possible, by the great cow-keepers of Middlesex, such as Mr. Willan, Mr. Allen, Mr. Rhodes, and others, and according to the distance, the crop, and the quality, the price will vary from eight guineas to fourteen per acre, the buyer being at the expence of pulling them up, loading them, and their carriage home. A great many turnips are also carried by barges from more distant parts of the county bordering on the Thames, which necessarily enhances the value of them in those neighbourhoods.

Beyond those distances they are fed principally by sheep, some are drawn for milch cows, for stall fed oxen, and now and then in a hard season given to young stock that are feeding in the yard.

Estimating them therefore as manure, and as food under the above circumstances, I am of opinion that they are worth to the farmer from eight to nine pounds per acre, if the crop is good. Their contiguity to a market town also must greatly increase their value, since the retailers sold ing, that you may not lose the season; for it must be considered extremely bad policy to hazard a late one, when you might have chosen an early one. As some sort of a guide, therefore, upon a point of so much consequence, I have acquired the following information from the best shepherds in this county, as well as in Sussex, which, indeed, corresponds with my own observations during turnip seasons.

A flock of 200 hungry Wiltshire sheep will consume 30 acres of good turnips in about three months, or ten acres to a month, or from 15 to 20 pounds weight per sheep, if they are allowed as much as they can eat. A flock of Berkshire, or Dorset, or Somerset wethers will require from 13 to 14 weeks to consume the same quantity. A flock of South Down, or Leicester wethers, will take near 16 weeks. But whatever be the kind of sheep that are put to turnips, they should always have some chopped sweet hay, about six or seven pounds, some beans or peas, or some oats, every morning before they have fresh turnips, to warm and coat the stomach as it were, and to prevent the ill effects of so much raw watery food upon it. I think all turnips should be fed off by the middle of March, and the sheep then turned to cabbages, or broccoli, until the first rye is ready, by which time the first tares will be ready, and so to follow in due order the one after the other.

Having stated as above what I consider to be the value of an acre of turnips differently situated in this county, it may be a very fair question to ask what I consider to be a reasonable crop, upon which I have grounded my estimate. A statute acre of land contains 43,560 square feet; suppose every turnip occupies a space of 18 inches, and that they weigh one with the other one pound, there will then be upwards of 14 tons weight upon each acre; but it is no unusual thing to see a crop in kind land moderately cultivated that will average two pounds, and then it will yield upwards of 28 tons. Where they are however very highly cultivated, and in a soil that they like, I think an acre of tankard turnips would produce upwards of 40 tons of most excellent food. Mr. Montagu Burgoyne, of Essex has, by measuring a rod of ground, and weighing the produce, ascertained, that an acre of red round turnips will yield 9 tons 7 cwt. and an acre of white round, 20 tons 15 cwt. What crop or crops of grass will yield as much in the course of one year, supposing the whole produce could be ascertained with equal certainty and precision?

soil for turnips, but by giving it a good dose or dressing of quick lime of the best quality that can be procured, ploughing the land very deep before it is laid on, in order that when the lime comes into contact with these minerals they may be separated from the soil, and afterwards become neutralized, and by their gravity sink eventually below the usual depth of the roots of either corn or pulse. It is not absolutely material that they should be made to sink so much below the roots, seeing that neither the one nor the other can do any sensible harm, because their natural injurious tendency has been destroyed by the operation of the lime; but I think, if by deep ploughing, we can remove to a distance the smallest chance of injury, we effect a very material improvement in rural economy.

Turnips are subject in particular soils to what is called the worm, an insect about one inch in length, very slender, of a bright red colour, with long horns, very agile, having several legs by which it is enabled to move with great celerity. Whereever there is a hole in the turnip, or even an excrescence, one or more of these insects will be found there, which upon being disturbed, will throw itself instantly into an offensive posture, twisting itself about, and immediately making its way into the ground. I do not find that they are peculiar to any soil, but they certainly prevail more in sandy and light loamy soils than in any other. I have frequently met with them in shallow chalky soils, and I have seen them in the heavy soils of Tooting, Peckham, and Camberwell. It is not unusual to find them in tolerable abundance in old dunghills and hot-beds, such as are become quite rotten. I should be much inclined to think from this circumstance, that they are engendered in the dung, which being carried out as manure for the turnips, produces the mischief we have so much reason to complain of. I do not remember to have seen them prevalent in turnips, where the land had been manured with lime.

This subject may, perhaps, be worth examining, because, if it turns out that they are found in land that has been manured with dung, and not in that which has been manured with lime, it may lead us to extend our inquiries and researches still further, by trying what state of dung it is which is most apt to produce them, whether in a state of fermentation, or after it has gone through every stage of fermentation and putrefaction, and is reduced to the condition of absolute vegetable mould; or which is not the least interesting, throwing out these hints, in order that those who have more opportunities than myself may take up the subject.

The fly is an insect that is said to be very destructive to the young and tender turnip. To their punctures, perforations, and frequent attacks, the loss of many a valuable crop is ascribed; with what propriety or certainty those assertions are made, we shall presently examine.

Turnips, as well as the rest of the tribe of Brassica, in contradistinction to all the leguminous and farinaceous plants, spread their seminal leaves upon the surface of the ground. These leaves contain the essential oil of the seed, which, when diluted by the moisture of the atmosphere, forms an emulsion of the most nourishing quality.

This richness, which pervades the tender seminal leaves, offers to the whole host of insects a treat of the most delicious kind; and, among the number of devourers, the musca or fly certainly makes one. But whoever has attentively observed the first bursting forth of the plant through the ground to its final destruction, must have seen that the fly is but a very secondary insect, and from whose perforations there is much less to dread than from other insects of a different complexion. Mr. Vagg was satisfied, from many years observation, that the small white, or grey slug was the enemy of all others the most to be dreaded, and to him we are indebted for the idea of night rolling, which, as far as it could go, was the most efficacious method upon some soils that was then devised, and as far as it has come to my knowledge, that has since been devised for their destruction; but it was very far from being effectual in rough, stony, and hard soils. My own observations for several years fully confirm the opinion of Mr. Vagg, and it is further corroborated by that of several eminent agriculturalists in this county.

Upon examining the leaves a few days old, it will be seen that the first attack is made on the under side of the leaf, it is pretty evident that this cannot be done by the fly, because it always settles on the upper side of the leaf; we must therefore look for the slug, which late at night, (perhaps all night,) and very early next morning, will be found at work on the leaves or on the stalk; after eating one or more of the leaves, he makes his way to the heart, which he completely eats out, by which means the plant is entirely destroyed. Not so with the fly, his position is almost invariably on the upper side of the leaf which he perforates, but he chalk, with powdered whiting, with powdered lime in a quick state, with masons' sand, with oatmeal, with wheat flour, with flour of brimstone, with snuff, with tobacco dust, with soap ashes, with malt dust, with tanners' bark, with fern ashes, wood ashes, furze ashes, and with peat ashes, with coarse mustard and rape dust: these trials sufficiently prove to me, that although, perhaps, every one of them will prevent the slug from getting at the plants so surrounded, if it was not there before, and will in many instances kill it if it ventures to pass over those barriers; yet scarcely any of them kept away the fly, and the same perforations were as visible upon those plants as in those of any other part of the field. Notwithstanding which, they weathered the storm, and the first rains made them bid defiance to every future insect. Many of those plants on the contrary which were not so surrounded, but which were adjoining to the others on all sides, were totally destroyed by the slug. In my own garden I have often noticed, that in a dry season, both turnips and radishes have had their young leaves so perforated and eaten by flies, that nothing has been left but the bare membranes; these plants I have watered of an evening with a water pot with a fine rose for a few nights, when the plants have taken to growing, have put forth fresh leaves, and have experienced no more than a temporary check.

I have tried the same mode in various parts of a field of young turnips with the same success, from all which I am led to conclude, that it is not the fly we have so much to dread but the slug. If I am right, the following hints may be of service. In moderate weather, and in a soil not unfavourable for turnips, the seed, if good, will vegetate in eight or ten days; let it however be examined, and as soon as it breaks ground, let the whole field be top dressed with some one of the following articles, soot, wood ashes, peat, furze, fern, or soap ashes, malt dust, saw dust, or powdered chalk: a dressing of either of these applied in the evening after the ground has been first rolled and made smooth, and in quantities in proportion to the strength of the article, will, I have not the smallest doubt, not only secure the plants either from the slug or the fly, but will give fresh life and vigour to them, and prevent the necessity of previously applying so much manure to the ground for that crop as is usually done during its process of fallowing.

In every lot of seed which a man buys for his own sowing, he is obliged partly to take such as the seller has to dispose of, and if he can but trust they become a desirable food; and if they are not destroyed by them, they are nevertheless reduced to such a state as to cause their inevitable death.

This circumstance offers another substantial reason why every farmer should not satisfy himself with sowing seeds in the same state that he buys them, even supposing that he is certain they will all grow, but should carefully clean them again and again, until there is nothing left but sound, good, full bodied seed.

Our next object is the state of the land; in vain shall we expect strong vigorous plants, let the seed be what it may, if the ground is worn out, or naturally poor; for in such a soil what is there to nourish and to carry forward those plants, if the weather, as must be expected at such a season of the year, proves hot, windy, and dry? If the crop fails, we say, (without perhaps any examination) that it is destroyed by the fly, when we little think, that if there was not an insect in existence, it is more than probable that the whole would have died off for want of due support from the ground.

The caterpillar frequently attacks the turnip, but not in so early a state as the slug, generally about the time that it has acquired a month or six weeks growth, when that is the case it is usual, if the field is near the house, to drive a number of poultry the first thing in the morning over it, who will presently rid the plants of these devouring creatures; but in my humble opinion, if the plants are top dressed as I have before described and recommended, I think it very probable that these insects will find some other food rather than continue their visits to plants so served.

I am not aware of any other disease or insect to which turnips are subject.

As turnips, like cabbages, are very apt to run away from the true sort by repeated sowing, and saving the same seed without paying proper attention to their selection; I should strongly recommend to every attentive farmer to look over his turnips every year, and from among them to select with great care as many of the fairest and truest of the sort he may wish to cultivate, as may be likely to yield him a full complement of seed. It is not necessary that these should be the largest roots, but they ought to be of good size and perfectly sound. They should be transplanted into a good soil previously dug deep, and planted in rows two feet six inches asunder, and from 14 to 18 inches apart in the row, according to the sort and the size of the roots, to be afterwards twice salt petre powdered and put into the milk pan with the new milk, will effectually prevent either the one or the other from being tainted. Or

Let the pans or the leads be constantly kept clean, and well scalded with boiling water before they are used, and when the milk is brought into the dairy, to every eight quarts add one quart of boiling water, then put up the milk into the pans or leads to stand for cream. This method will keep it sweet all the winter and spring.

In a hard winter, and in deep snows, and when dry fodder of all kinds may be scarce, it is not unusual to feed the stock, and sometimes the flock too with turnips in their different yards. Mr. Marshall has given us an account of an instrument called the snow sledge for uncovering these roots. It consists simply of three deal or other boards, from one to two inches thick, ten to twelve inches deep, and seven to nine feet long, set upon their edges in the form of an equilateral triangle, and strongly secured together either by nails or straps of iron at the angles, at one of which is fastened, by means of a double strap, a hook or eye to hang the horses to.

This instrument, being drawn over a piece of turnips covered with snow, forces the snow into a ridge, while between the ridges a stripe of turnips is laid bare without having received any material damage by the operation.

Should, however, these turnips rot in the ground, perhaps the loss of such a quantity of good food may be in some measure compensated by the immense advantage arising to the ground from the quality of the manure into which they are converted. Prodigious were the quantities that rotted in the spring of 1803; and in the farms where this happened, I was astonished to see the state of the crops that followed all through the season. The barley was uncommonly fine, and some spring wheat, that was sown without any other dressing, turned out a better crop and sample than any of the winter wheat upon the same farm.

In the course of my repeated journeys into Worcestershire and Staffordshire, in the winter and spring of that very scarce year, 1800, I met with bread at different gentlemen's and farmers' houses, made from every sort of farinaceous and esculent plants; among the rest was some made from turnips, which appeared to me extremely palatable and wholesome; and thinking that the knowledge of it might be attended with some use, I wrote out many copies of the recipe, which I distributed only look but taste like the best bread. So good was it esteemed by the lady of the house where I first saw it, and who favoured me with the recipe, that she assured me she always used it in her family during the winter months, and she was satisfied that it proved extremely nutritious, and highly serviceable to her, as well as to many poor families to whom she generally gave some of the loaves when they were sickly.

Before I close this interesting subject, I shall beg to say something more respecting the yellow or Swedish turnip, as related by Dr. Campbell of Lancaster. "In the year 1796 I sowed a few drills of this turnip; these attained a good size, and were not at all affected by the severe frost of that winter, which destroyed the general crop of other turnips.

"The thermometer fell on the 27th of December of that year, to 12 degrees of Farenheit, which is an intensity of cold that the common turnip cannot withstand. It is certainly an acquisition of no small magnitude, to have a winter food for cattle which is inaccessible to frost, so that it can at all times be taken fresh from the field where it grows, (for however the ground be frozen, they may be got up by a pick axe,) and which continues in perfection through the whole spring of the year, so late as the month of May, until grass springs again.

"These properties of the Swedish turnip point out the propriety of its constituting a part of the winter food, at least, of every person who has a stock of cattle. It seldom happens that any frost, so severe as materially to injure the turnips, occurs before Christmas; and if the common sorts were to be resorted to until about that period, and the Swedish for the remainder of the season, we should have so certain a supply as to bid defiance to any inclemency of weather.

"There is one circumstance attending the cultivation of the Swedish turnip which deserves attention, which is, that they will not come to a large size without a considerable quantity of manure, (stable dung.") In this I must dissent from the worthy Doctor, because I have grown them as large as ever were seen in England, in no more dung than is usually given to other turnips, and such were grown in many parts of the western division of this county in the winter of 1802 and 3; but then it was a point with me that the land had been deep ploughed, and brought into a fine tilth, which is of infinitely more consequence than a su-

Winchester bushels of each, the one weighed 180 pounds while the other was 264 pounds in weight. For the table, the Swedish is certainly the best turnip that has yet been introduced, and where it is known bears a decided preference in the market.

"The seed of the Swedish turnip should be sown in May, in order to give this species an opportunity of acquiring its full size.

"I am sorry to observe an inferior variety of the Swedish turnip becoming more general for these two last years; it is not distinguishable whilst growing, but is upon pulling;" (this is too true, for I saw a great many of them dispersed over the kingdom in the winter of 1801) "the rind is white whilst the true Swedish is yellow; the one puts out large tap roots which renders it unsightly, and less marketable, whilst the true sort is round and compact as to its roots. It is also less palatable for the table. Great attention will be necessary on the part of those who raise the seed, to get rid of this species, otherwise this turnip may get into unmerited disrepute."

These turnips were very much cultivated in different parts of Surrey last winter by some spirited farmers, who found their account in them, during the spring months, when their other sorts were destroyed by the extreme variableness of that season; some of them gave them to their draught horses accompanied with a small quantity of clover hay, upon which they throve uncommonly: when the roots were taken up, the tops were cut off and given to the stock in the yard. The turnips were then put into a wide tub and washed clean, as if they were intended for market, and after the foul water was let off from them, they were cut into small pieces by the turnip hoe or chopper; (described among the implements of husbandry) with this instrument a woman or boy will cut as many in half an hour as will be sufficient for four good horses the whole day. They are by many Surrey farmers called the Swedeland turnip.

In stall feeding of oxen with turnips, it is usual to give them a certain portion of sweet, soft, meadow hay as well as turnips. They are given to them at night and morning, and the hay chopped is given to them at stated periods in the course of the day. An ox that is put up for fatting, and weighs from 75 to 85 stone of eight pounds to the stone, will eat in 24 hours from 200 to 240 pounds weight, besides his hay, which may be from 14 to 20 pounds weight, according to the season of the year; and supposing him to be in good thriving them at 16lbs. In 1758 there was one pulled up near Tudenham, in Norfolk, that weighed upwards of 29 pounds. There have been turnips of an immense size grown by the late Mr. Austen of Walworth, Mr. Michael Martin of Lambeth, both in this county, through entire fields. The former picked over his fields and selected some of the finest roots, which he transplanted and saved the seed for me, which by care continued to produce equally fine turnips for several successive years.

In November, 1803, a red round turnip was pulled in a field belonging to Mrs. Moody of Longtown, near Carlisle, in the county of Cumberland, which weighed 30 pounds, and measured 40 inches in circumference; this plant was raised among others from seed of her own saving. It is no unusual thing to see a single and accidental red round turnip in a field of white, of dimensions greatly exceeding the white, and which would oftener be the case with a crop of red, if they were usually sown as early and with as good a preparation of soil as the white sorts are.

RAPE OR COLE. BRASSICA RAPUS SYLVESTRIS.

Tetradynamia Siliquosa. Linn. Sp. Plant.

The cultivated rape of this country is a very distinct species of plant from the turnip, as evidently appears from its several characteristic properties. In some counties, particularly Cambridgeshire, Lincolnshire, and a part of Essex, very large quantities are annually grown for the sole purpose of the seed, from whence the oil known by the name of rape oil is expressed. But in this county its growth is entirely confined to the feeding of sheep, for the purpose of improving the ground by their folding it off, or by ploughing it in green. In either of which cases, its cultivation deserves to be much encouraged by every lover of Agriculture. By the sportsman it is in high estimation, for in whatever field rape is grown, to that spot resorts partridges, pheasants, and hares, where they lie in luxurious enjoyment, until the fatal period arrives for their destruction.

This plant is grown in small patches in the different parts of the connty, but no where in such abundance as distinguishes the South Down farms from those of most other counties; or as the plant, considered either as a meliorating crop, or as one that tends to afford an abundance of rich food for a very valuable stock, deserves. It is calculated for all sorts of soils, from the argillaceous, through the calcareous, to the silicious soil; and in every

November, or December. In March it is dragged across, and in that direction ploughed its proper depth; in April it is well harrowed, and the weeds collected and burnt, or carried off the ground, afterwards dunged or dressed with chalk or lime, or other manure, and regularly and uniformly spread over the ground; it is then turned in with the snap or swing plough, very seldom into ridges, unless the soil is very strong; the seed is sown broad cast upon the furrow in some instances, in others after being once dragged, it is then harrowed, and in a few days it is lightly rolled.

Sort.—I know but of one sort that is kept in the shops, which is the same as that from which the oil is expressed, and goes by the name of the common rape or cole.

Steeping is no where used, nor is it necessary.

Seed.—As the seed from rape is not so liable to those changes which prevail among turnips, being of a much hardier nature, it seldom happens that it is found of more than one colour, which is a jet black; it is, of all the Brassica tribe, the roundest, firmest, and in general the most regular seed as to size and shape. Whenever it is otherwise, unless the season satisfactorily accounts for it, you may rest assured that it is mixed; but at all events the seed should be previously tried, as was directed for turnips. From one quart to three pints is the usual quantity sown per acre. As it is both a smothering crop and a feeding one, it is necessary that it be sown thicker than turnip seed usually is.

Seed time is from the beginning of May, all through that and the months of June, and July, but it is not adviseable to sow later, the first growth being intended for autumn feeding, the latter for spring feeding.

Cultivation.—None is necessary unless the ground is very full of charlock and docks, when the latter are pulled up by hand, and it is customary to mow the tops of the former as soon as they come into flower to prevent their seeding. But to have it strong and fine, it should be hoed twice, and thinned out as turnips usually are; only leaving the plants closer together (which may be done with a six inch instead of a nine or eleven inch hoe,) and being so treated, will make a wonderful increase as to its quantity of feed.

Consumption.—Scarcely an instance is to be met with of rape standing for seed as a regular crop in this county; therefore, it may be said, that every crop of it is invariably folded off by sheep. The fault in Surrey is that they sow it too late, the same sort of feed, those that were fed upon rape averaged 7*s.* per head more than those did which had been put to turnips, although, at first, the value of each sheep was as nearly equal as it was possible for the shepherd to select them. This crop should always be eaten clean, and immediately ploughed, in order that such of the plants as may not be destroyed, and may afterwards vegetate, may be effectually destroyed before the corn is sown; otherwise, they will prove hurtful to it.

In addition to the consumption of rape as green food, it is also used as dry meat, both for sheep and fatting oxen in the form of oil cake. This is nothing more than the pulp and the husks being compressed by the crushing mill into flat cakes, (like flat house tiles,) after having all the oil expressed from the seed. These cakes are chopped or cut with an engine into small pieces, and are given to the cattle at certain times in the day, sometimes accompanied with some sweet hay, at other times, and by other people, without any. If so small a portion of oil as can be left in these cakes is found to be so productive of fat to stock, it is fair to suppose, if the seed was only gently pressed, and the first drawings off of the oil only taken from it, and these cakes then given to the stock, (being first reduced into pieces as is usually done,) along with some well made clover hay cut into chaff, that they would improve more than the difference between the value of the two sorts of cakes in the same period of time.

I am led to this opinion from knowing, that stock fatted faster upon oil cake formerly (all other things being alike) than they do now, and from its having been admitted by several eminent crushers and manufacturers of these cakes, that they are obliged to express them closer than they had used to do, and by that means to draw out as much of the oil as they possibly can, in consequence of the great advance in the price of the seed, &c. The price of these cakes is dearer than formerly, and infinitely inferior to them in weight and quality.

DISEASES AND CASUALTIES.—The young plants of rape are subject to be destroyed by slugs, by a small black fly of the genus called aphis by naturalists; (for a most accurate description of which, see Mr. Curtis's works) by a worm about a quarter of an inch long, and which the Sussex farmer calls the black canker; and afterwards by the green caterpillar: but all these insects may easily be preimmense tract of fen country; where some of their descendants are still to be found upon the spots that were reclaimed by the indefatigable industry and perseverence of their ancestors. It was their practice to grow rape with intermediate crops of oats for a series of years, which the then quality of the land enabled them to effect; their object, however, in growing it was for the seed, which they crushed with the very same machines or mills that drained the country, and from which, as I before observed, they expressed the oil called rape oil. This plant was confined to this part of the kingdom for many years, under a persuasion that it would only grow in such a deep miry soil; but the farmers in Northamptonshire, observing how profitable it was in Lincolnshire, sowed it upon their uplands with equal success, and from hence it spread (with that slow and cautious progress which marks the improvements in Agriculture) over the other counties in England. In Flanders the hulls of the seeds are preserved, which, with the sprouts of the plant, are given to the cattle; and with the haulm or seed stalks they litter down their yards. In the district of Lisle, in French Flanders, which encompasses nine square leagues, they made annually from ten to twelve thousand tons of oil from that plant; but I have lately understood that the manufacture suffered so much during the revolution, as to have been almost annihilated. The produce of seed in our country is generally estimated at from six to eight quarters per acre, and upon the average of the last ten years has sold for £30 and upwards per last, or £3 to £3 15*s*. per quarter.

The uses of this plant are well described in Pliny's Nat. Hist. lib. xix. cap. 5, and the Dictionnaire de Commerce, tom. III. col. 1477.

The price of the different sorts of cakes is as follows: and may be had at any of the respectable crushers or oil mills, particularly of Messrs. Jackson and Dampier, Primrose-street, London; and who have favoured me with their prices, which are subject to a small variation, agreeable to the prime cost of the seed.

Rape cake, at seven guineas per 1000.

Mustard cake, at ditto, per ditto.

Lin or flax seed cake, each cake weighing about three pounds, at 14 guineas per 1000.

Note.—These cakes are usually called oil cakes.

They will be delivered at any wharf or carrier's inn in London, at the above rates.

Mr. Edward Try, of Stockwell, is in possession paring the animal in a fine way for the serious period of calving.

TURNIP CABBAGE, AND TURNIP-ROOTED CABBAGE.

BRASSICA OLERACEA.

Tetradynamia siliquosa. Linn. Sp. Plant.

In Professor Wildenow's edition of Linnæus, we find the several prominent varieties of cabbages very accurately displayed, with the exception of the two sorts I have above-mentioned, which are however known to preserve their distinguishing characters as perfect as any of the cabbages he has enumerated. The former uniformly produces its bulb or turnip above ground, while the latter invariably grows under ground, and so correct are they in this disposition, that during 30 years experience in growing them annually for seed I never knew them to vary, or to run from the one sort into the other.

The turnip cabbage delights in a strong rich loamy soil, but will come to tolerable perfection and with considerable profit in lands that are not so.

The turnip-rooted cabbage, on the contrary, delights and comes to the greatest perfection in light, loamy, and even sandy soils, of good depth, where the root or bulb can swell with freedom and ease; like the other sort, however, it does not despise the strong loam, nor the calcareous loam, but the less stony or flinty, and the richer it be, the larger will be the root, and the greater the quantity of feed. In point of hardiness, I have always found the turnip-rooted to have the preference; but in point of magnitude of root, supposing each to be planted in a soil that exactly suits them, the advantage will also be in favour of the turnip-rooted. It is therefore advisable to consider the genius of the soil before either sort is grown, that the most proper one may be selected, since the expence of the seed, and the charges of cultivation are exactly alike.

Among the farmers throughout the county, I have not, during a pretty exact examination for the last four or five years, been able to find any one of them that has cultivated either the one or the other sort. Among gentlemen who farm their own lands, I have every here and there found (occasionally) half an acre, and from that to one acre in good garden-like cultivation. Their encomiums on the value of them were sufficient to have induced a larger growth, but for reasons which I never could rightly understand, they did turned under pretty deep, and the ground left as rough as possible, this is supposed to be done as early in November or December as possible; in January the land is well dragged, the couch and other weeds are collected together and burnt, this operation will bring the land tolerably fine, however strong it may be, if care is taken to do it only in dry weather. As soon as that is finished, plough it across a considerable depth, at least twelve inches, but deeper if the land will admit of it, and leave it rough; let it lay in this state until the end of March, when in all probability the frosts and rains will have pulverized it, but whether they have or not, it must be harrowed down with the ox-harrows, and shaken well about, the weeds collected and burnt if there are any. Dung or manure the land well, plough it in shallow, and leave it until planting season.

The first week in May harrow it down, plough the land across deeper, fixing, to the left or right side of the plough (according as it may be going either up or down the field) a light harrow, which will level the ground that is fresh ploughed, as it goes on. If the ground from any circumstance is not sufficiently pulverized, the roller must pass over it, and be followed by the harrows until it is. If the soil is likely to be wet in the winter the ground must be formed into lands, according to circumstances; but if not, it is best to be entirely level. With a small plough, or with a hoe and line, draw shallow drills longitudinally, the same as for peas, at two feet six inches row from row, and in these drills dibble in the plants, at eighteen inches asunder, beginning with the largest and cleanest plants first, and so proceed until the whole ground is planted; by taking this precaution the plants will come to perfection in the same progressive order they were planted, and the crop will be thereby regular. By being planted in drills, instead of upon the surface, as is usually the practice, the plants are more readily watered, in case of very dry weather setting in at the time of their being planted; the drills will keep them sheltered and moist until they have struck root, and they are landed-up from time to time with greater ease and facility; plants so treated will thrive better, faster, and become much larger than those which are planted on the surface.

Sort.—There are no varieties of either of these two sorts; but which ever sort your soil suits, and which you intend to plant, be particular to ask for it by its proper name, for as mistakes frequently the safer way is to buy it some time before it is wanted, and by trying a certain number of the seeds as directed under the article of Turnip, a most correct notion may then be formed as to the quantity necessary; but it is the better way to have a few hundreds to select from, and even to throw away, than to run short at planting time.

Seed time.—Having made choice of a piece of kindly soil either in your garden, or in some advantageous part of the farm, and having by proper digging brought the ground into a fine state of pulverization; in the first or second week in March, prepare a bed or beds four feet wide, with alleys of eighteen inches wide between them, (if more than one) on these beds sow the seed thin but as regular as possible; and with some of the same soil taken out from the alleys, cover the seed very lightly over, and gently rake the ground. While the plants are growing, and before they are fit for transplanting, prepare a quantity more ground, into which, when the plants are ready, you will prick them out, so that they may stand about six inches asunder, always transplanting the largest and best first, until the whole are so disposed of. If the weather is dry pending such transplanting, give the beds two or three gentle waterings, in order to settle the ground about the plants, and to make them strike root more freely. The next matter is to get the ground ready for their reception, and where they are to remain for a crop. This should by no means be later than the first week in May, in order that the whole may be finished by the end of that month. The night before the plants are taken up, give so much of the ground as contains the strongest plants a good watering, which will facilitate their drawing without injuring their roots. If this plan is resorted to every night the plants will rise well, and it will also encourage those weaker ones that are left behind to gain strength. After the ground is all planted, the same should be looked over from time to time, and any vacancies occasioned by death or any diseased plants that may be found, should be filled up in order to secure a full crop.

CULTIVATION.—Having taken care to keep the beds in the first instance well weeded, and in case the plants should advance rapidly, to thin them out from time to time, planting them first in beds at even distances asunder, and eventually removing them to the field where they are to remain for a crop, where at first starting, in case of necessity, they ought to have one or two good waterings; as bandry, that no spirited farmer would choose to risk such an imputation for the paltry consideration of a few shillings; and therefore they should be hand-hoed with care, so as not to injure the former landing up of the crop. In this state they will remain clean and in high vigour all the winter.

CONSUMPTION.—This crop is usually fed off in the spring after turnips or rape. If the soil is favourable, I am of opinion that one acre of the turnip rooted cabbages that have been planted in due season will weigh upwards of 30 tons; they are sweet, somewhat resembling the cocoa nut, as well in consistence as in flavour, much firmer and less succulent than even the Swedish turnip, consequently less liable to produce water in the stomach. Its quality is highly nutritive and wholesome, and as I have before said grows well in all soils, better at least than any sort of turnip, being also much later and hardier, it is so valuable an acquisition, that it is only astonishing that those who are advocates for turnips should pay so little regard to these plants.

Professor Linnæus, in his Hortus Cliffortianus, describes the plant we have just treated upon, as the Brassica radice caulescente tereti carnosa, or English sea cabbage.

BODLEIAN

SCOTCH AND DRUM HEAD CABBAGE. BRASSICA OLERACEA. δ CAPITATA.

Tetradynamia siliquosa. Linn. Sp. Plant.

These two cabbages are kept distinct in the shops, but as they are only seminal varieties, with scarcely any characteristic mark or property by which they may be readily known: and as they are always liable to return to one and the same sort, requiring also the same treatment throughout their cultivation, I have not thought it worth while to separate them, and therefore I propose in this detail to consider them as one and the same plant.

They are grown in great abundance in the neighbourhood of London, such as at Walworth, Camberwell, Peckham, Lambeth, Battersea, Wandsworth, &c. as well by the large market and farming gardeners, as by the cowkeepers, &c.

In the more distant parts, they are principally grown by gentlemen and the more enlightened farmers, but not upon a larger scale than from half an acre to about one acre. If it be an advantage to a farmer to grow a crop that shall be not only nutritive and hardy, but that shall in point of quantity of food, upon a given spot of they are applied as a preparative for barley, if fed off during the autumn and winter; and if late in the spring, for wheat in the ensuing autumn. As soon as the preceding crop is carried, plough up the etch pretty deep; I mean somewhat deeper than usual, inverting the soil, and lay it very rough. In January, or February, drag it well, collect all the couch and weeds, burn them on the ground, or lay them regularly over the foundation of a heap of hot dung, cross plough the land considerably deeper than before with a trench plough, and leave it as rough as you please; these two ploughings should give a depth of at least 18 inches. If the weather in February and March shakes the soil well, and it slacks or crumbles to your mind, run the drag over it across, and leave it again rough; at the beginning of April drag it again, and if the clods are not broken sufficiently, run a heavy roller over them, and again drag it, and should any weeds or rubbish arise, they must be collected and burnt upon the ground. Lay a good coat of dung or mixen upon the ground, spread it evenly, harrow it about, and plough it a moderate depth; but not in lands, unless the soil is apt to be very wet, if it is, large lands will be sufficient, because a few water furrows, when land has beeen ploughed so deep, will keep the land dry enough for this crop; harrow it down immediately with the small harrows, run a barley roller over it, and draw your drills three feet six inches to four feet apart, according to the condition of the ground, the state of the plants, and the forwardness or backwardness of the time of year you are planting; in drawing the drills a hoe and line are the best tools, but a small Suffolk plough dexterously applied is a good instrument for the purpose, and the drills may be about four inches deep. If your plants are ready the first week in April begin to plant, and so continue all through the month of May, but not later on any account, for I have tried them repeatedly in Surrey and in Hertfordshire, in June and in July, and they were no larger or better than some I saw in a field at Bookham, in December 1802, which would not average six instead of 40 or 50 pounds each cabbage; the earlier they are planted, even in March, the larger and firmer will be the cabbage,

Sort.—Enquire of the principal seedsmen for either sort, but as the seed from those which are called the drum head are saved from the largest and finest cabbages in general, it is not amiss therefore to enquire for the latter; but having tried seed

SEED.—Again let me advise the reader not to trust to appearances, for in a dry harvest after a dry summer, there will be a great deal of very small seed, which, for want of due moisture, did not receive a necessary supply of nourishment to fill out all the seed, and therefore such are not perfect; in a wet season the seed will ripen at different times, and exhibit all the appearances described under the article of turnip, and especially, if it is put up damp, or in any quantity together; let it, therefore, be tried in due time, so that you may not be disappointed of plants at the proper season for planting out.

SEED TIME.—Those who are anxious to have very large cabbages to fat off oxen forward, should sow their seed in October, very thin in beds, in the manner described for the turnip rooted; otherwise, the first week in March is the usual time. The fresher the earth in which they are sown the stronger will be the plants; but let me repeat, sow always very thin, and transplant them into beds as soon as they are fit for that purpose, in order that they may gain every possible degree of strength before they are planted out for good; the extra labour is nothing compared to the great advantage which the plants will acquire from it.

CULTIVATION.—The plants being fit to put out, and the ground ready prepared with drills, drawn from three feet six inches to four feet asunder; begin dibbling the plants in, at two feet six inches apart in the first row, planting them in the second row in the intermediate space, which will be also at two feet six inches; in the third row the plants will stand opposite those of the first row, and those in the fourth row will be opposite those in the second row; this mode of planting will give the plants more space and air. If the weather proves very dry, a little water given to the plants will be the means of settling the mould about the roots, and make them strike the sooner, which is a circumstance well worth attending to. This being done, and the plants growing as well as the weeds, flat hoe them in about three weeks, and draw the mould to their stems as directed for the turnip rooted. In three weeks more they will require a second flat hoeing and earthing before the plough is put in, when they may have a shallow landing up, and a second landing up with the plough in a month afterwards, which possibly will suffice for the season.

Consumption.—At whatever period of the winter other food becomes scarce, the largest and forberwell, by Mr. Whiting, and Mr. Martin of the former, and by Messrs. Austen and Emmett of the latter; Mr. Austen had, I believe, a contract from the victualling office during the American war for these cabbages, for the purpose of being made into sour crout.

I think it was about the year 1778 that he and the late Mr. Edmonds of Deptford, a very eminent farming gardener, purchased nearly two acres of young plants that had been self sown; owing to a very dry windy seed time which opened the pods, and scattered a great deal of the seed, before and during the time of its being gathered; those gentlemen gave us 5*s*. per thousand for all we had, and which produced us nearly £20 per acre, and to the growers between 30 and 40; as they proved to be the largest and most firm that they had ever seen; scarcely a cabbage weighing less than 40 pounds, and many of them above 60 pounds weight. It is principally for this reason that I am inclined to give the preference to the autumnal sowing, as well as to the early planting. They are so very nutritive, that with the addition of some nice clover, sainfoin, or meadow hay, one acre of good sound cabbages will fatten four lean six or seven year-olds Sussex or Herefordshire oxen, in about six months; each of which will consume from 160 to 180, and if very large animals, nearly 200 pounds weight per diem of 24 hours; a yearling calf of the same breed will eat of the inferior sort of cabbages, I mean those which may not be of the true kind, about 80 or 90 pounds, with some good barley straw in the 24 hours.—A South Down full mouthed wether will eat about 15 pounds, with some chopped sweet hay, or beans, in the 24 hours.—But a Wiltshire, a Berkshire, a Dorset, or a Mendip wether of the same age, will eat from 20 to 24 pounds within the same time; a good acre will therefore fatten upwards of 50 of the former, and about 40 of the latter; and, independent of such superior advantage, perhaps no food produces such an astonishing quantity of manure.

Upon the whole then, I dare venture to affirm, that no article deserves more the attention of the spirited agriculturalist, for independent of their being possessed of those excellent qualities I have just mentioned, they prepare the land in a high degree, either for wheat, barley, beans, or peas, without any additional manure, and will yield amazing large crops for two or three courses; and as they are not tenacious of any particular soil, so that

SAVOY. BRASSICA OLERACEA.

Sabauda alba vel flava crispa tetradynamia siliquosa.
Linn. Sp. Plant.

Professor Wildenow places the Savoy as the fourth variety of the species oleracea, which he distinguishes by the Greek character ι, of which, however, there is one subordinate variety called the green curled, which is the sort in greatest request and cultivation. The white which he describes is not very common in England, unless he means the yellow, which is what I suppose it to be.

Savoys are not in general cultivation upon any of the farms in the county, as an article of stock feed, but they are almost always introduced by the great cowkeepers and farming gardeners in the county of Surrey and Kent. They deserve a place in this report, because they are grown upon a large scale for those purposes, supplying the cowkeeper with an ample store of good food during the months of October, November, December, January, February, and March.

They are sometimes succeeded by a crop of wheat, or barley, and sometimes by turnips, tares, rye, peas, or beans, according as the ground may happen to be cleared, or the state of provender may make the one or the other necessary, and for either of which they may be considered a good preparative. The land is in all respects prepared in the same way as for the Scotch cabbage, a reference to which will preclude the necessity of further detailing this operation.

Steeping is never used.

Sort.—The green curled is the hardiest, although the yellow is somewhat the largest.

Seed.—The same precautions are necessary with this article, as for all the other kinds of Brassica.

Seed time.—Early in March is a very proper time to sow the seed, to obtain very large heads, although many people sow in April, but those Savoys that are raised at that season are more fit for the table, than as a profitable article for cattle.

Cultivation.—The plants should be put out at three feet row from row, and about two feet in the row, in drills as before described, and planted with a dibble, which a handy man or woman will do with great expedition. It is also adviseable to plant them in the quincunx manner, as all cabbages should be. If the weather is favourable, they will be in condition for planting the first week in April,

Diseases.—The only one to which cabbages as well as this plant are subject, is that of clubbing, which evidently proceeds from the land not having been sufficiently deep prepared, by which means in a dry time, their quantity of food is insufficient to carry them along, and the understratum from its tenacity being impenetrable to the roots, the plants become stagnant, their juices dry up to a jelly, and they immediately become food for insects, which making a lodgement in the main root swell it out and form what is usually called its club; it may be occasioned also by being planted too late in the season, by the tap root being bent nearly double in planting, instead of going strait down, which will necessarily check the regular flow of the juices, and hence cause a protuberance or swelling in the part so bent; it is likewise occasioned in some silicious as well as argillaceous soils, by the presence of iron and vitriol, which corroding that part of the root with which it happens to be in contact, arrests the circulating juices, and produces the protuberance before-mentioned. It follows, therefore, that the disease in question is in every instance within our own power to prevent, by a proper attention to a deep preparation of the soil; by sowing the seeds and then transplanting the plants sufficiently early for them to be well rooted and thriving before the dry weather sets in; by a due attention to the fixing of the roots straight and free, yet firm in the ground, and by the application of lime, in order to discharge the ferruginous and vitriolic particles that may be in the soil. If these precautions are attended to, I have no doubt, we shall very seldom hear of the clubbing of cabbages and savoys.

RED AND GREEN BORECOLE. BRASSICA OLERACEA.
ζ Laciniata, tetradynamia siliquosa. Linn. Sp. Plant.

Of the cultivation of either of these valuable vegetables I have met with no instances in this county among any of the farmers, beyond what may be sufficient to supply their tables. It is the more to be lamented, because all of them who grow them in their gardens cannot be ignorant of their hardiness, and must admit that they yield a large quantity of tender esculent food all through the spring months.

For a certainty I know that horses will do uncommonly well upon the sprouts of borecole, especially the green, and I am of opinion that cows, fed upon them a month or six weeks before calving, will have an unusual flow of milk at that critical period, when, if they were fed in the common pasture, the scantiness of the feed will scarcely be either to sheep or milch cows, the yellow leaves, as well as the decayed ones, should be first pulled off, otherwise they will impart a rankness to the milk.

ANJOU CABBAGE. CHOU DE MILAN. BRASSICA OLERACEA.

Tetradynamia siliquosa. Linn. Sp. Plant.

Amongst the several varieties of cabbages which are enumerated by Professor Wildenow, there are none which seem to apply to the two plants abovementioned; indeed his description is so very short and concise, that it becomes very difficult to discriminate them, without referring to other authors whom he quotes. The plants we are about to describe are very different in character from each other, are easily known, and cannot be confounded with any of those sorts I have already detailed, or that are usually cultivated either in the garden or the field. But notwithstanding they are both of them very hardy, and afford an abundance of highly nutritive food, yet so slow are the cultivators of the soil in the introduction of any plants which are not in their common and ordinary course of husbandry, however strongly they may be recommended to their notice, that we do not find either the one or the other of the above varieties cultivated in any part of the county.

I grew them both in Hertfordshire, and have introduced them in other parts of the kingdom where I have had the management of the property as agent, and have always found them so extremely useful after a severe winter, and a very dry, cold, piercing April and May, when all the Swedish turnips were consumed, and the grass was scarcely begun to spring; that were I to farm again I never would be without some of them, as they continue sprouting as fast as the preceding sprouts are gathered. They greatly increase the milk of cows and ewes, without giving it any unpleasant flavour.

The seed should be sown thin in beds of kindly mould in the month of September, and afterwards transplanted into beds, there to remain until the March following, when they should be put out for good in the field where they are to remain at three feet six inches row from row, and about two feet in the row; they should have two flat-hoeings and one regular landing-up, when, if they grow kindly, the former will yield about 12 tons, and the latter about 10 tons per acre of good feed.

POTATOE. SOLANUM TUBEROSUM.

Pentandria monogynia. Linn. Sp. Plant.

ling, the American or purple: these several sorts are raised by gentlemen, by farmers, by gardeners, by tradesmen, and by cottagers, just as circumstances may occur.

The cluster, the ox noble: these two sorts are those which are chiefly raised for cattle.

Among the principal growers in this county, Mr. George Adam, who resides opposite the late Duke of Bedford's, at Streatham, is unquestionably the largest. The very animated, disinterested, and spirited conduct of this gentleman during the unparalleled scarcity of the year 1800, very deservedly entitled him to the thanks of his countrymen, and as a mark of their distinguished approbation the lord mayor, court of aldermen, and common councilmen of the city of London, unanimously voted him the freedom of their city.

So active, and so alarming were the combinations of the great growers of Essex, and of the northern counties, that had it not been for the spirited exertions of this gentleman, who, having most fortunately a very large stock, not only took no advantage of the prevailing scarcity of corn, &c. by raising the price of his potatoes, but he effectually broke the neck of the combination, and kept down the price of that useful article in all the markets of London, and probably too in all the markets of the kingdom. Such conduct deserves to be recorded, and handed down to posterity as an example worthy to be imitated by every true patriot. Mr. Adam holds a great deal of land in the parish of Streatham, stretching from his house westerly down Mitcham-lane, being a loam of a middling quality, in some places rather shallow upon a gravel, in others a deep argillaceous soil upon a sour retentive clay. Upon this land he grows potatoes and various other crops, such as grain, pulse, and cabbages.

PREPARATION.—It is a question with many growers of potatoes, especially farmers, whether they are or not an impoverisher of the soil. Formerly the advocates for their introduction into the routine of farming crops, considered them in the light of enriching crops; but now that idea is done away, and the term *meliorating* substituted; this is perfectly just, for if they are properly treated no system of culture tends so much to loosen and pulverize the soil, from the first ploughing the ground to the final taking them up, nor can any thing short of an absolute fallow of winter and summer ploughing, &c. cleanse a foul piece of land like potatoes. If, as it sometimes happens, like the present dry season, there are two growths, above all plants, a deep and fine tilth; supposing the land to be left foul after a crop of white grain, particularly oats, the stubble or etch is shallow ploughed, and the furrow inverted, and left rough. In a month or six weeks, as the weather may suit, harrow down the ridges, and tear the land about with the ox-harrows. Women and children being employed at the same time that the ground is being harrowed, in picking out the couch and other root weeds, which in the evening are usually burnt on the ground, and the ashe sspread early the next morning before the plough is set to work; they then plough it across from 16 to 18 inches deep, if the ground will permit, laying the furrow on its side, and in this state it is suffered to remain until the first week, or fair weather in January, when it is well harrowed about, rolling it if necessary, picking, collecting, and burning such weeds as can be found; the land is then immediately ploughed up and down about 12 inches, and turned clean over, by which operation the soil will become intimately mixed, and well pulverized. About the end of February the furrows are harrowed down, and a coat of well fermented dung, or a greater proportion of any good mixen is laid on the ground, which being spread evenly, is ploughed-in about 10 inches deep, about the middle of March, or somewhat later if the nights are very frosty: the ground is then harrowed smooth and even, and according to the sort of potatoe that is intended to be planted, drills or furrows are drawn with the plough at three feet row from row, or two feet six inches, the larger growing sorts being for the former, and the lesser ones for the latter distance.

These drills should be eight inches deep; at the bottom of these drills the sets are planted at 18 inches asunder, and are covered with the same soil from the sides very lightly. In about 10 or 15 days the ground is examined, and if it is found that the plants are beginning to appear, the short-tined harrows are drawn first across, and then up and down, as well to loosen the ground as to tear up the young weeds which may have begun to grow; this process will also level the ridges, and prepare the ground for the subsequent hoeing.

This is, however, not the mode usually adopted by Messrs. Edmonds, Martin, Whiting, Emmetts, Grinsteed, and some of the other great growers, who uniformly plant them with a potatoe dibble, which is an instrument about three feet six inches long, with a cross handle mortised on the top, tolerably stout, sufficiently long to take hold sions the sets to rot, and in my opinion is one of the true causes of the disease called the curl. This is never the case with sets that have been planted in ridges or drills, because the ground is always loose all round them. I readily grant that the planting with the dibble is done with the least trouble and expence, and is withal the most expeditious, and the high condition of their land, (to use the expression of my friend Mr. Brown) being generally drunk with dressing, may prevent the earth from becoming so hard round the hole into which the set is planted; but as the information we wish to convey is intended for gentlemen and farmers whose lands can seldom boast of being so circumstanced, I have no question at all about the preference being decidedly in favour of the drill. In all cases where the land is not very wet, I should not by any means advise their being planted in beds, because the alley or water furrow between them would in a dry season draw all the moisture from the beds into it whenever a flush of rain fell, and prevent the good effects which would otherwise accrue to the plants. I will not suppose them to be planted in a palpably wet soil, because it would be impeaching the judgment of the planter to imagine that he would attempt to put in either this or any other crop before he had laid it completely dry either by under or surface drains.

When land is very foul and the quantity to be planted is not very extensive, I should recommend the ground to be double trenched, an operation which, though well known to every gardener and nurseryman, is so little understood either by gentlemen or farmers, that a detail of the manner of performing it may not be uninteresting here; I shall therefore describe it as well as I am able.

Set out the ground four rods wide, divide it down the middle, take out a trench at one end three feet wide and two deep across one of these divisions which will be two rods wide, wheel the soil taken out of this trench either into any hollow and uneven part of the quarter, or else on the ground in the next division, and in a straight line with the trench now opening. The first trench being open, pare the surface of the second trench three or four inches deep, into the bottom of the first trench, by which means whatever weeds may be there, that is, on the surface, will be buried so deep, as will effectually destroy them. One spade deep is taken out of the trench, and thrown upon the parings; the crumbs, as it is called, (which is the loose soil that falls from the spade in the act of should be planted upon the surface, and a small quantity of the soil pared down from the side of each ridge upon them. When they are landed-up it is done by the same operation of paring down the sides towards the plants. If the land is thought not to be rich or mellow enough for potatoes, a proper quantity of dung may be laid into each trench after the first spadeful of soil is taken out, and trenched along with the soil, which will in part mix it, and which, during the future operation of landing-up, will become further mixed with the soil in a very complete manner. But it is not an unusual way to wheel the dung between the ridges after the ground has been trenched, and to point it in; then to draw a shallow drill with a hoe, put the sets therein, and cover them up with the sides of these small drills; but this mode is extremely objectionable, because if the dung is placed only in the furrows or drills, the soil with which the plants are landed-up is materially different from that in which the set was planted, consequently as the one is rich and the other poor, or at least, as the one is both richer and looser than the other, the fibres will be confined to that part which is so circumstanced; now, whoever has examined potatoes that have been planted upon a dunghill where the surface is equally rich, will find that the fibres invariably spread horizontally so long as they can find nourishment, and never downwards; they are then within the influence of the sun and air, and the produce is in consequence larger, more numerous, and farinaceous than those whose fibres are obliged to seek downwards for food, where only the dung is placed, which becomes sooner exhausted than if a greater proportion was diffused through the soil of the ridges; the fibres, therefore, begin sooner to fail, the root or roots become thereby set and ripen, and the produce is less in number and size, and not so farinaceous; and should the season have been dripping, they will be watery, and by that means are easily affected by frosty weather.

Among those gardeners who plant the early sorts for market, the custom is to prepare trenches in the same way as they are prepared for celery, under a south wall or pale fence, and parallel with it; in these trenches some good rotten or spit dung is put, on which a very slight covering of fine rich mould is placed, the set (which is often the small potatoe entire) is planted at the distance of seven or eight inches, a small quantity of the same rich earth is put on the set just enough to cover it, It is necessary by the way to observe, that in proportion to the quality of the soil, a greater or less quantity of dung or other manure must be added; and by the same rule, the larger and coarser the potatoe, the wider or narrower the sets will require to be planted from each other.

The soil, most congenial to the growth of potatoes, is the sandy or light loamy soil; from which an inference may be drawn strongly corroborative of what I have advanced, with respect to confining the dung within the trench in which the sets are planted, in this case, it is clear that all the land will neither be alike light or rich, and can in no shape assimilate with the sandy soil. Indeed, one of the best crops I saw during the summer of 1800 was in the parish of Chailey, in Sussex, upon the estate of Mr. Jones, where the sets had been planted in a strong loam upon a yellow clay; the sets were planted in furrows drawn by the plough, having a layer of furze at the bottom and some over the sets, to keep the ground hollow, and the mould was drawn gently over them. The interval between the rows was well dunged and ploughed under shallow; about a fortnight after the sides of the furrows were ploughed down, a sort of nidget or horse-hoe was drawn between the rows, which loosened the surface, mixed the soil and the dung completely together, and fitted it in a very excellent manner for landing up, and for the reception of the young fibres of the roots, by which means, no doubt, the crop felt the good effects of it.

Seed time.—The ground being got ready in March, they begin to plant, and continue through that and the two succeeding months, for it is no uncommon thing to see the cowkeepers planting potatoes after a crop of rye has been cut off green. The earlier they are planted, if no frost succeeds, the finer and more abundant will be the crop.

Cultivation.—As soon as the plants are four or five inches above ground, flat-hoe the side of the ridges internally, which will pulverize and loosen the soil, and cause it to fall loosely about the plants, which will operate as a gentle earthing. In three weeks from that time, they may be treated in the same way, only increasing the quantity of earth at this landing-up. In three weeks more the small Suffolk, or a light Rotherham plough may be introduced, which by taking a part of the hill down, will give the roots a good landing-up; and in another month the middle of the ridge may be split with a stronger plough, and the soil thrown landing-up the stems keeps the roots moist, and prevents the extreme heat of the summer's sun, or the drying winds and frosts, which of late years have prevailed in June, from injuring them, enabling the young fibres to strike into the fresh soil, and the bulb to swell and expand; and to acquire its full complement of farinaceous substance. In a wet season the bulbs are not so watery, nor so much injured by worms, when landed-up, as when the whole surface of the ground lies flat; because the landing-up throws the water from the roots into the middle between the rows, which are in general below the bulbs, where it soaks away without saturating them, and consequently they will be more farinaceous and wholesome.

CONSUMPTION.—The larger sorts of coarse potatoes are given to fatting oxen, with chaff and chopped hay, sometimes steamed, at other times raw, but washed clean and sliced; they are also given to milch cows steamed, and to hogs steamed and raw. The haulm is often cut twice for milch cows by the cowkeepers, but the practice is found to injure the bulbs; nevertheless, they continue to do it, for if the summer proves very dry and hot, they are often put to great inconvenience (after the rye and tares are expended) for green food to keep their cows in a flush of milk. A principal cowkeeper had a large field opposite my house of at least twenty acres, and, after drawing off a full crop of turnips, he prepared the ground in the best manner, and manured it plentifully with cow dung. In April, he planted his sets with a dibble by a line. In June he began to mow the haulm, and continued mowing every day as much as suited his consumption until the whole field was gone over. By the middle of September they had grown again nearly as much as before; he then began mowing again, and he continued until the frosts in October killed the shoots of those which were left. I attended their being taken up, they were very prolific, but the roots ran small. I measured several distinct square rods to ascertain the quantity, and found that the acre yielded about 300 bushels, and were worth £16 per acre; the sort was the champion. One circumstance was very visible, that those bulbs, from whence the haulm was first cut, were much less in size, and fewer in number, than other parts of the same field, which I took to proceed from an excess of bleeding in so young, vigorous, and immature a growth. As we bought all the milk which our and is only to be replaced or renewed by a fresh change of palatable vegetable food, at least for a certain period after calving.

A full crop of champions may be reckoned at ten tons, of red nosed kidneys near eight tons, of Nicholson's seedlings nine tons, of the Manley's and white nosed kidneys not more than five to six tons. Ox nobles and the Irish red potatoe not being much cultivated in the county, I can only say, that as far as I can judge from the information I have collected, the former will average nine or ten tons, and the latter about eight. They are for the most part ploughed up with a sowing plough, and the ground is immediately well harrowed and again ploughed up for wheat or winter tares.

When I was at Paris, I learnt that sago, of a most nutritive quality, was made from potatoes, a discovery which had been made by a very respectable gentleman with whom I have the pleasure of being acquainted, Monsieur Parmentier, and who was deputed with Monsieur Hussard by the national institute, to view the shew of cattle at Lewis in 1802.

M. Parmentier was led to the discovery from an idea, that the fecula of all tuberous roots, as well as the seeds of gramineous and leguminous vegetables contain this mucilage, and are absolutely identical; the principal being one and the same in nature. He proposes, therefore, to add a spoonful of the fecula of potatoes gradually to a pint of hot water or milk, to be kept stirring for half an hour over a gentle fire. Sugar may be added, with aromatics or spices, such as cinnamon, lemon-peel, saffron, orange flour water, rose water, &c.

The sago of potatoes may be prepared likewise with veal broth, chicken broth, or common broth. The preparation may be varied in a thousand ways, and it forms a very wholesome and nourishing food.—See Parmentier sur les recherches des vegetaux nourissans.

Potatoes are sometimes made into flour, by ordinary and easy processes. The root is first washed clean, it is then pounded or crushed in such a manner as perfectly to destroy its texture; the pulp is then put into a sieve, and water poured on it which carries off the fecula, and deposits it at the bottom of the receiving vessel. The water which is covered by the extractive matter, and part of the parenchyma that remains suspended, is decanted off, and the deposition is washed several times.

potatoe haulm, tired of it, and would so far nauseate at it, as in a few years to dwindle to its original wild stock; the same holds good with improved breeds of cattle; so the potatoe by not being carefully selected, choosing the fairest roots, eradicating every root that has the symptom of curl whilst growing, manuring occasionally with lime, chalk, coal ashes, wood ashes, &c. keeping the ground open, and, not by concentrating the manure as they do in many parts of Lancashire, but by dressing the whole ground, and inviting the fibres to expand on all sides in search of fresh food, by which means they are enabled to support and nourish a very extensive produce. In no county that I know of are potatoes so subject to the curl as they are in Lancashire, and it was so prevalent a few years ago, that it was difficult to procure any that had not been more or less affected by it; at that period, I was rather an extensive annual importer of the finer sorts, and upon enquiring into their mode of culture, in consequence of the great injury which had been done to the potatoes by this disease, it occurred to me, that the principle in their management was fundamentally wrong: to plant roots or sets in long hot dung as they do, or usually did, which, instead of producing putrefaction in order to fit them for vegetating, if there is not dung enough to destroy the vegetative faculty, there is enough to produce mouldiness which covers the whole set, and which can only tend to check and injure the power of growth, and to produce the curl or some other disease. But as the putting this long dung into the furrows or drills upon which the sets are afterwards planted,

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centrating this matter as manure, it is but and the only advantage proceed from it, is that of hollow and open, in order expand and swell. If I am the purpose would be better an- straw, haulm, fern, or furze, as the then run no risk of being injured by the and offensiveness of the dung. Let try the experiment fairly, and he will be red that my position is not far removed from truth, that one cause of the curl arises from mode of concentrating the manure; for it is universally admitted, that fresh soil and a change of situation will eventually cure it; now, the meaning of fresh soil can only be understood to be such as has never been manured, perhaps at any period, native soil, of one quality, and which by ploughing

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the fibres, the growth of the plant, nor the produce is at all equal to the preceding. Plant a third root upon the same fresh soil as the two former, but without any manure at all, but the ground properly prepared by pulverization, and it will be found, that although the stems and shoots will not be so rude, there will be a robustness in the general contour more resembling the sturdy oak, indicative of sound health, and characteristic of native vigour. It will also be found that the fibres of these have on all sides dilated themselves round the parent set to the full extent of the external part of the plant, whereas, in the second experiment, they have only followed the direction (as near as possible) of the long dung, and they will be found to be every here and there diseased; and again, upon examining the produce, the bulbs of the latter will be more firm and close grained, more farinaceous and less aqueous than either of the others; the bulbs of the first will be more abundant, but less valuable; and that which was planted in the long dung will be more aqueous, spotty, easily affected by frosts, and in every point of view the least valuable. The concentration therefore of manure is a mistaken policy, it is tantamount to the putting of a plant into a pot, which so long

as there is room to extend its roots it grows; when the pot is filled with them, if it is not immediately shifted into a larger one it dwindles, takes the curl, and dies.

That the curl does not proceed from cultivating the same potatoes on the same land, (I do not mean on the same spot of land,) when they are properly attended to, is very evident. I grew some potatoes in the year 1802 that had been grown upon the same farm for nearly 20 years, and which produced an abundant crop of uncommon fine potatoes, and Mr. Nicholson, at the Duke of York's, from whom I had the seed originally when he lived at Sir Thomas Rumbold's, in Hertfordshire, has grown them at Oatlands, the seat of his Royal Highness, principally in the kitchen garden, or on that part of the farm which adjoined to it, for upwards of 15 years, and they are as good and as true now as they were at first; and of which his hogsheads of their very best early sorts; we also received several hogsheads from our correspondents in Cheshire, all of which we learnt were more or less diseased. It was necessary to lessen the violence of this disease, and to attempt to destroy, if not to eradicate it, before we could presume to offer them to our customers. We therefore proceeded in nearly the following manner.

Having early in the autumn cleared a large quarter of fruit trees, the ground (which was rather a strong argillaceous soil) was double trenched immediately; at the breaking up of the first severe frost which had shaken the ground very much, the whole was levelled down as well as it could be, and a large quantity of old rotten tanners' bark was laid over it full six inches deep, and also a fair sprinkling of rotten dung from hot-beds over that, the ground was then single trenched longitudinally, and left rough in ridges. The season proving very severe, the frost had made a strong impression upon the ridges, and reduced the sides to a fine powder, but as that did not mix the whole body of it, the ridges were thrown down, the soil, &c. mixed as intimately as possible with the spade, and afterwards by repeated harrowings; when the tan, and the dung and soil were thought to be sufficiently incorporated, the whole was single trenched across, by which means the position of the ridges became nearly due north and south. In March, the fairest of the potatoes were picked over, the best of them cut into sets, and planted in the spaces between the ridges, which made the rows to be about two feet six inches, or eight inches asunder. As the plants were so much sheltered while young from the bleak easterly winds by the ridges, they grew fast, and they were as often landed up, being previously flat hoed as they became four or five inches above ground, until the ridges were pared down quite level, and the haulm began to shade the ground. As the curl had unusually prevailed among these potatoes (as I have before observed) the year before, we could not but expect a certain portion of it at least this, and certainly when they first broke ground, and until the fibres had taken good hold, appearances were much against them; but by repeatedly hoeing the ground, and keeping it perfectly free from weeds by raking them off, paying an unusual attention to their being properly landed up in due season; and the tan and dung not only keeping the ground moist, open, and loose, but giving to the soil which might be called fresh, a certain degree of richness; we found that in one sort a great part of the curl began to raking off the weeds, and one more landing up; every diseased plant was taken up as soon as discovered, let the period of its growth be what it might, and taking advantage of a moist time while the plants were in blossom to give them the last hoeing merely for the sake of stirring the ground; the plants which in general had thriven in a very inferior manner to the former sort, now began to look fresh, the leaves to expand, the blossoms to be more full and bold, and a very striking alteration for the better was soon visible throughout the quarter, so much so that several potatoe growers thought them so perfect as to offer us a large price for them as seed; they were not, however, sufficiently so in our view of them, and as they were not the sort of customers we had grown them for, we took care not to sell any without advising the purchasers what were our sentiments of them. The produce was considerable, and the bulbs appeared clean and fair, and sufficiently farinaceous.

In the following season the disease appeared very partially; at the late Mr. Macnamara's, at Streatham, which is a strong, cold, clayey soil, and not very nicely prepared for them, the disease might be said to have returned; the same happened at Tooting, at Mr. Samuel Rush's, though in a much less degree; at the late Sir Thomas Rumbold's, in Hertfordshire, at the late Lord Bute's, at Highcliffe, in Hampshire, and at Mr. Portman's, at Bryanstone near Blandford, scarcely an appearance of the curl was to be seen, and from other parts of the kingdom we received the seed back again the following year, to all intents and purposes free from disease. We had a great many left after all our orders had been supplied, and having cleared a large quarter of forest trees in the course of the autumn, as was our usual practice every year, with some sort of tree or other, and being further desirous of following up the experiment, we trenched this ground in the same manner as the other quarter was trenched, with a similar application of rotten tan and dung, some road scrapings, a small portion of lime, and the mould from some hot-beds, together with the refuse mould from plants that had been shifted, all previously mixed together, and well incorporated; we were induced to make use of this mixen because the land was so uncommonly tenacious and stubborn, as not to be workable in a dry summer, and being withal near the gravel made it always burn and crack. After it had lain all the winter in ridges, and having been otherwise treated the same as the quarter was any return of the disease. It fared the same with the former sort, which partook of a similar treatment in every stage, and we kept them both for several years, planting them one year in one quarter as it was broken up, and another year in another quarter; taking especial care to keep them clean from weeds, and regularly rogued, as well with regard to those plants which were disposed to sport and run away, as to be diseased; by which mode of treatment they were kept true and pure, and what was of the utmost consequence to us, we always found the land in the highest possible condition for any young crop of trees.

I have thought it necessary to be thus circumstantial, notwithstanding the prolixity of it, because it will prove to a demonstration that the curl is to be effectually eradicated without sending into the north for peat or moss bogs, and as the mode of doing it is within the abilities of almost every man, it will be no small gratification to me, if I shall prove the humble instrument in lessening at least, if not totally extirpating so fatal a disease.

Conservation.—They are generally put into long pits sunk about two feet below the surface of the ground, and raised considerably above the level of it, in the shape of the eaves of a house, only very sharp, in a dry and airy place; the potatoes being put into the pit, are covered with a thick coating of dry wheat or rye straw, and upon that a layer of the soil that came out of the pit, pressed down as smooth and as tight as possible, to prevent the rain from penetrating into it. Great care should be taken that the potatoes are perfectly dry before they are put into the pit, for by a neglect of that sort I lost above a hundred bushels one season by rotting. If these pits are made properly, they are secure and proof against a severe frost; but should it be suspected that they have been touched by it, it is possible to prevent the full effects of it by extracting the frosty or nitrous particles from them; this is done by putting them into cold water as soon as a thaw approaches, and letting them remain there a convenient time until they are purged as it were by degrees of all the nitrous spiculæ which the air by its activity would agitate, with such violence in a thaw, as to lacerate the substance of the root, and reduce it to a soft pulp or liquor; the water in this instance seems as a lixive to suck away those minute thorns by slow degrees, and without offending the solids of the root.

It is another circumstance remarkable in the an- [redacted] celebrated for them. They travelled, however, so slow towards London, that it was 40 years before they were much planted there, and then only as great rarities. About that time they were said to have been grown by Dr. Edward Stillingfleet, father of our great naturalist Benjamin Stillingfleet, of South Lambeth near Vauxhall, in this county, and by him to have been distributed to the great agriculturalist, Sir Richard Weston, Bart. of Sutton, also in this county, and other eminent men of those days, and probably by that means to have been dispersed through this county.

In the transactions of the Royal Society of London, it is observed that at a meeting held there on the 18th of March 1662 and 3, a letter was read from a Mr. Buckland, a Somersetshire gentleman, recommending the planting of potatoes in all parts of the kingdom to prevent famine. This was referred to a committee, and in consequence of their report Mr. Buckland had their thanks. Such members as had lands were entreated to plant them, and the very learned John Evelyn, Esq. of Wotton, in this county, who was among the first fellows of that noble institution, as well as a singular benefactor to it, was desired to mention the proposal at the close of his Sylva. See Birch's Hist. Roy. Soc. Vol. I. p. 207.

It appears therefore remarkable, and a proof of the difficulty of introducing any new thing into the system of cultivation, that it required something like the force of authority to cause the cultivation of this valuable root to become general in those days.

Count Rumford observes in the 2d volume of his last edition of his valuable Essays, fol. 146, that potatoes first moderately boiled, and then skinned and cut into thin slices, and properly dried, (for doing which he has invented a machine upon a very simple construction,) may be kept good for many years. In seasons of scarcity such a mass of excellent food cannot fail of being of the highest consequence to the navy as well as to the army.

CAROTS. DAUCUS. CAROTA γ SATIVUS.

Pentandria digynia. Linn. Sp. Plant.

There are only six species of this genus described by Professor Wildenow, of which three are biennial and three annual; the plant now under consideration ranks among the former, and is the only one that is used either in agriculture or for culinary purposes.

The preparation of the soil is not alike in any of these divisions, in some, carots are sown after a crop of peas, either garden or field. The ground is ploughed in November with a common swing-plough, not deep, but turned clean over. In March it is harrowed down, manured with twenty loads of rotten dung, and ploughed across somewhat deeper: about the end of the month, or beginning of April, it is trench ploughed 16 or 18 inches deep; from the 14th to the 20th of that month, the land is rough harrowed down every way, the seed having been previously prepared, is sown broadcast upon this harrowing, and finished off with the fine harrows.

In other divisions of the county carots are sown after turnips, which have been previously well and clean hoed, and folded off by sheep, the land is then shallow ploughed, well harrowed, and afterwards trench ploughed, as in the former case, and otherwise treated the same. If the turnips have not been a full crop, they then add about 10 loads of rotten dung per acre, which is treated in the same manner as before described.

When the crop is sown after corn the etch is ploughed in the autumn shallow, and the stubble turned under. In February the ground is well harrowed, cleaned, and the weeds collected and burnt; they then lay on thirty loads of good rotten dung, spread it evenly, shallow-plough it under, and after giving it a good harrowing, so as to mix the dung with the soil, it is ploughed across; the first week in March it is harrowed down, again cleaned of all remaining weeds, ploughed deep, and treated in the manner before-mentioned. The land is, however, laid into ridges of about two rods wide, and after the seed has been harrowed-in, it is rolled with the barley roller.

At Peper Harrow, my Lord Midleton has generally broke up old ley for this crop; if he intends the ground afterwards for planting, he usually trenches the ground; if for arable, he double ploughs it, for fear of bringing up a poor hungry sand. Upon the ley previous to breaking up, the sheep are kept depastured upon it for some time, and in proportion to the quantity of dressing which may be left by these animals, so will be the produce. In no instance does his lordship use dung for this crop. The expence which has hitherto attended the cultivation has been so great as to induce his lordship to alter his mode of growing it, and he intends in future to repeat them on the same soil, with the interval of one crop manured two ploughings and harrowings, however well executed, and therefore the roots will only receive a partial benefit from this manure.

If it is objected that the potatoes will have extracted all the salts from the dung with which the land had been dressed for that crop, and consequently that the carots derive no advantage, and that by the folding off the turnips they have the full benefit of the manure left by the sheep; I reply, that in the common kitchen garden culture of that root, it is an invariable rule never to dung purposely for it, especially if it can be brought in to succeed one that has been manured for; and even in fresh broke up land, carots are found to be larger, clearer skinned, and finer flavoured without any dung having been put on the land, than when it has; and the reason seems to be, that dung when perfectly rotten or fresh, forces the plant to a premature growth, it causes it oftentimes to run to seed the first year, by which means the root becomes of no value, if it does not run to seed, it becomes hard and sticky, or it becomes very fibrous and spotted, and of course not marketable; we are therefore led to conclude that potatoes bid the fairest (with the exception, perhaps, of field cabbages,) to be the best preparative for the growth of carots.

Whatever crop precedes carots it seems agreed that at least two ploughings are judged necessary, and in some instances three, and that one of these ploughings, say the second, is always very deep; that dung is often used, although, as I have said, it does not seem necessary; indeed, the sort of dung which in most cases I have seen applied, can be considered scarcely in the light of dung, having but little of excrementitious matter in it; it is rather a combination of straw, fern, and other litter, which has been soddening in holes full of rain water in the yard all the winter, occasionally trod about by a few miserable cows and young stock, and then thrown up early in the spring in heaps, to have all the moisture drained from it, and the nitrous particles exhaled; such is what is called dung, and such is what I have seen applied as a dressing for carots.

SORT.—The long orange carot is the only one that is used for rural purposes; but the early horn is also cultivated by the market gardeners to stand the winter, and to come in for early spring use for the table.

STEEPING is more likely to do harm than good, and therefore it is never used.

The SEED, having its margin covered with forked seed, the complexion of the season in which it is sown, and the nature of the soil in which it is to grow.

Seed time.—The latter end of February, through the month of March, and to the middle of April is the time which the seed is committed to the ground by the farmers and growers in the different parts of the county; Lord Midleton always sows about Lady-day. The earlier, however, they are sown, if the weather proves favourable, and the land is clean, the larger and finer will be the roots. At whatever period they are sown, care should be taken to make choice of a calm day, without which it is impossible to sow the seed regular or true.

The early horn carot is generally sown in beds in the month of September.

Cultivation.—As soon as the plants are regularly come up, and that they can readily be distinguished from weeds, which, according to the season may be in six or seven weeks, the crops are hand weeded; by some of the farmers they are hand-hoed, with a small onion or carot hoe; by the time the whole crop is gone over it is necessary to thin the plants out, which is generally done by a four or six inch hoe, setting them out at about seven or eight inches asunder, and cutting all the ground clean. Some farmers harrow the crop a week before this hoeing, and others do it ten days or a fortnight afterwards; the intention of the first is to tear up some of the weeds, to loosen the surface, and to fit the ground for the hoe; by the latter it is intended to displace any of the old weeds that may be left after the hoeing, to loosen and destroy the young ones that may be growing, in case the season should have been moist. Many persons who do not use the harrows, think that they must do the plants a great deal of harm; those, on the contrary, who do use them, say, and they speak with the evidence of the fact, that the harrowing of the crop does not hurt the plants, but by killing the weeds, and drawing the soil to the plants, does them a great deal of service. After this operation, they are hoed a third time, and set out at the distance they are to remain, by a nine-inch hoe, which is usually from 14 to 16 inches asunder. This hoeing ought to be done clean, because if the plants take to growing, and a dripping season should set in, so as to cause a fresh growth of weeds, it will be almost impossible to hoe them again withont running the risk of injuring the plants. The hand weeding, which is by the nice growers never omitted, will, according to five or more feet wide, and about six feet high, in the shape of a cone, piling the outside of the cone with the crown of the carot outwards. Some farmers, who have an abundance of out-buildings, pile their carots upon a foundation of clean wheat straw, perfectly dry, and after raising them to the height they intend, they cover them over with the same dry straw, and in this situation, if they are taken up dry, they will continue quite sound and fresh. Other farmers, who have none of those conveniences; after taking up the carots, cut off their tops quite smooth; a trench is made in a dry part of the farm, the carots are there placed as close to each other as possible in an upright position; when the trench is filled, they are covered with pea haulm, or wheat straw laid close together about eight inches thick, but rising in the middle like a ridge, and the mould that was taken out of the trench is placed over the straw, and clapped down smooth and tight with the back of the spade. Others again sink an oblong pit, and after taking off the tops put a layer of straw at the bottom, upon that a layer of carots, and cover them over with sand, repeat the layer of roots and sand until the heap is sufficiently high, when they are covered up with straw and mould as before described, and in this state they will keep sound all the winter.

PRODUCE.—This crop will be found not to vary so much as many other crops, although a difference will necessarily happen between a kindly loamy sand in good heart and tilth, and kept properly weeded, and another of a sharp quality, and in no respect so well cultivated; yet I have not met with crops in these situations that have varied even in the greatest extremes, more than from 14 to 18 loads, of 40 bushels to the load, to the acre; but taking a fair comparison between the value and the condition of these soils and their crops, the difference would not be more than two or three loads. In the parish of Elstead particularly, the crops are large and fine, perhaps quite as good as any that are grown in any other part of the kingdom; indeed, I am given to understand that they are particularly valued at Covent Garden market. As far as my own experience goes, I must do the growers of this parish the justice to say, that they in general exceed those of Sandwich, Chard, Somerton, Woodbridge, Saxmundham, Sandy, or any other place.

Upon collecting together the several growths of the county it appears to average near 15 loads, or 550 bushels per acre.

Consumption.—They are given to horses of all they may be used very profitably in all large dairies.

For fatting hogs about 50 bushels boiled are required, but for store hogs they are given by some farmers boiled, and by others raw and with the tops on.

Oxen fatten firm and well upon them; but the quantity necessary for that purpose must depend upon the state and condition, but above all, upon the size of the animal. An ox of 700 pounds weight, will eat in 24 hours about 250 pounds weight of carots, of which, with the addition of some sweet hay, one acre will last him 154 days; but as he will not take more than 80 days to fatten, provided he was in a kindly thriving condition when he was first put to carots, it follows that one acre will completely fatten two of those bullocks.

One acre of carots will also fatten 34 Dorset full mouthed wethers, or 40 South Down wethers of the same age in about 50 days.

For dogs they prove a cool nutritive and wholesome diet; and I am confidently informed that they are in some degree a preservative against madness.

The tops are sometimes cut green in the month of July for cows, and I understand that it has been attempted to make them into hay, and provided the carots have been regularly thinned out, and the roots left at a proper and uniform distance, the crop forward, and the heads large, an acre is said to yield from three to four tons of good hay, which is made in the same manner as clover. If the weather is foggy or gloomy, or if drying winds prevail, such an operation as taking off the tops is attended with material injury to the roots, because they bleed so much more freely and abundantly in such weather, than in that which is clear and sun shining.

Carots it seems were first introduced into England during the reign of Queen Elizabeth by the Flemings who fled from their country to avoid the persecutions of those days, and settling about Sandwich, where the soil was peculiarly calculated for them, they were cultivated by them in great abundance, and with singular success. It was from thence that the London seedsmen were formerly supplied with the seed. They were first cultivated (in the neighbourhood of London) in the parish of Chertsey, for the supply of the London market, and they still continue to be grown there upon a large scale. The seed is saved by most of the growers of carots in the different parts of the county, particularly in the parish of Wokthey will produce a large quantity of saccharine juice, which may be converted into a vinous and an acetous liquor. Professor Marggraaf endeavoured to procure crystallized sugar from them without effect; but I have been assured that some of the French chemists had accomplished it. Dr. Hunter, of York, has made ale, spirit, and vinegar, from these roots, and he is induced to estimate the value of a good acre of carots for this purpose, after paying all expences, at the sum of £40.

He recommends a preparation of the roots for the use of seamen in long voyages in various ways, as a means of preventing the scurvy; one of which I will beg leave to transcribe for the benefit of those whom it may concern. "A palatable mess," says he, "may be made as follows: Take any quantity of carots in the months of September or October, let them be topped and tailed, and afterwards washed clean in warm water, scrape them, and cut them into pieces about two inches in length, throwing away such parts as are decayed. Put the whole into a large copper, with as much water as will preserve the bottom from burning. Cover them up close, and light a moderate fire underneath, so that the carots may be stewed and softened in the steam. When they have become sufficiently soft, let them be mashed and pulped through a coarse sieve. Then take a quantity of loaf sugar equal to the weight of the pulp, and according to the rules of confectionary, reduce the whole over the fire to a proper consistence, taking care to evaporate the superfluous moisture by continual stirring. When cold, put this marmalade into pots, covering it over with a paper moistened with brandy, and over that, such another covering as is generally recommended for conserves."

To make the mess, he directs it thus: "take of the marmalade above-mentioned, one large spoonful; salop in powder, one tea spoonful; acidulate with lemon juice or spirit of vitriol, then add warm water, half a pint; wine, four spoonfuls; spices, a small quantity if required. This mixture is highly antiputrescent and nutritive."

Sir Henry Vavasour, bart. of Spaldington, Yorkshire, has furnished a very accurate account of his mode of raising carots, and disposing of them on his farm, which not being generally known, may not prove unacceptable here. "Last spring," says he, "I sowed, broadcast, two acres of carots, following a potatoe crop on a light sandy loam, worth 20*s*. an acre. They are hoed twice at 13*s*.

passage was left for a small cart to carry off the tops, and another I made by drawing the young carots for family use.

"I have reason to consider this mode of cultivating carots equal to the best fallow crop, provided the carots are twice hoed clean, and the tops are cut off, as the scythe prevents any weeds seeding in the autumn.

"My horses, oxen, milch cows, and pigs are at this time eating the carot roots; my turkies, and other poultry have them boiled, and are fatted well upon them; even my pigeons are fatted upon carots, as they constantly attend in the fold-yard to pick up every particle that drops from the mouths of the cattle, which supply is sufficient to keep my pigeons at home, and to save any expence in feeding them during severe weather.

"The market price for carots near my home, 12 miles east of York, is from ten pence to one shilling per bushel, at which price it must be allowed that the crop is a profitable one. I must remark that the demand for carots in the neighbourhood is not inconsiderable for stallions; for it is found that this food is more invigorating and fattening than any other that can be given to them."

Carots have in general been confined to the silicious soils, but Mr. Stevenson, at the Marquis of Salisbury's, at Hatfield, in Hertfordshire, has cultivated them upon a large scale for several years. Now the soil there about is so far from being either a sand or light loam, that it is naturally a tenacious loam upon chalk, and by no means either free from stones or flints; yet upon this soil he cultivates them to very great perfection, both as to size, quality, and quantity; his expences are no doubt greater upon this soil than upon sand or loam, but so valuable is the crop for feeding his numerous stock, that he finds himself amply repaid by the superior condition of them, and the high state in which it leaves the land for any succeeding crop.

Before I close this subject, I cannot refrain from taking notice of the great impolicy of taking the tithes of such a crop as carots in kind. I have already remarked how much superior those which are grown at Elsted are above the rest of the county; and because the soil being peculiarly adapted to them, had induced a very large growth throughout the parish, and consequently has created a value to this land which, but for this crop, would be but of small value, so, unfortunately for the growers, the clergyman could not provement; and how much it tends to create a dislike for the church establishment. By demanding a very heavy composition for this crop in some places, and by taking it in kind in others, the clergyman has already very much curtailed the growth of carots in this parish; and many of the farmers have assured me that it was their intention to drop the cultivation of them altogether, rather than submit to what they call such an oppressive tax upon their industry and property. Let me here ask, if such measures were to prevail generally, would not the community be very great sufferers? Is it not a misfortune, that in order to gratify the avarice or worldly desires, or by whatever name it may be called, of one man, such a crop as this should be perhaps entirely abandoned by the whole growers of a parish? Is it not, then, high time that the legislature took up the subject, before it becomes more serious; and before we attempt to emancipate the slaves in our West India islands do something effectual to remove this state of bondage at home; and by a well digested plan fix a barrier between the avarice and oppression of the one, and the opposition and frequent injustice of the other? Every well-wisher to his country cannot but desire it; every man at all connected with agriculture has long seen the necessity of it; and it is to be hoped that it will be brought about before many more such occurrences happen.

PARSNIPS. PASTINACA SATIVA.

Pentandria digynia. Linn. Sp. Plant.

Professor Willdenow furnishes us with no more species than are described by his predecessor Linnæus. Of the three species that are mentioned, two of them are herbaceous or perennial, and the sort we are about to describe biennial.

This plant had been long known in our kitchen gardens as a most excellent and salutary root, before it was thought deserving a place in rural economy.

Its great resemblance and affinity to that valuable plant the carot, could not but arrest the attention of the French and Flemish agriculturalists, accordingly we find that in the states of Bretagne, parsnips were first cultivated as a crop for the feeding of cattle, of which a particular account is given, under the title of "Corps d'observations de la Société d'Agriculture, de Commerce, et des Arts, établie par les etats de Bretagne," p. 141, in which, after detailing the manner of cultivating it, Mons. Le Brigant says, "that cattle and hogs thrive equally well upon these roots, and that horses would eat them; but that they render them dull, quite a mistake about their going blind, or losing the use of their limbs. As he has followed the practice for several years, we can do no less than attach due credit to his observations. In Kent, too, my Lord Romney has grown them, and his lordship did me the honour to assure me, that they succeeded very well upon his soil, the crop proving very abundant, and that which was of the most consequence was, that his cattle of all descriptions liked them very much, and throve well upon them. We have, therefore, in this instance a further corroborative proof of the inestimable value of this root.

The prevailing sweetness of this root induced the French chemists to endeavour to extract sugar from it. And Marggraaf, by digesting the roots rasped or finely divided in alcohol, readily effected it. This fluid dissolves the sugar, and leaves the extractive matter untouched, which falls to the bottom, by which simple method the process is effected. Now, by the same or any other process which he tried, he could neither extract it from carots nor turnips. If, therefore, sugar or any saccharine substance has any influence on the system, so as to induce animals to become fat, (and we have daily sufficient evidence that it is not only highly grateful to the palate, but is conducive in a strong degree to that end,) parsnips, by possessing so large a share of it, must have a very powerful tendency to fatten whatever may feed upon them, and as such, must have a great advantage over those roots we have already treated upon.

If any additional merit can be due to this plant, it is, perhaps, that it is capable of being rendered subservient to the purposes of the revenue as well as malt, although, perhaps, not to so great an extent. It yields, by distillation, a spirit so pure and good, as to approach nearer to the best French brandy than any plant that is cultivated either on the farm, the orchard, or the garden; and we read in Houghton's Collections, vol. II, p. 461, that a patent was obtained for distilling carots and parsnips, but that the latter were infinitely the best, and came nearest to French brandy.

After having premised thus much as to the qualities, &c. of parsnips, it remains to give some intimation as to their culture. And first,

The SOIL should be a good clean hazle loam, a strong deep mellow loam upon a dry, gravelly, or sandy bottom, or even a sandy soil if not sharp and hungry; but strong clays, until they are made open by proper dressing, deep ploughing, and good cultivation, or strong shallow loams with a by the taking up the roots, and by the subsequent ploughings, &c. and therefore it can hardly fail to be more loose than by any other mode. The land is usually set out in ridges or lands, of a rod or 24 feet wide.

Sort.—There is but one sort, which is called in the shops, the large swelling parsnip.

Steeping is not necessary, because if the seed is old, no steep or liquid will revegetate it, and as it is always understood that none but new and fresh seed will grow, and as no insects attack the young plants which any liquid or preparation can prevent, it is therefore never used.

Seed.—The quantity of seed usually sown is from four to six pounds per acre, according as the season is wet or dry, early or late, or the soil strong or light, or the quality of the seed is more or less perfect, that is, well ripened, and free from any semblance of dark brown or black among it. The seed when sown fresh and good should be sown thin.

Seed time is from the first week in February until the first week in March, but I have known it sown in the middle of October with very superior success, and also as late as the beginning of April; it is, however, proper to observe that seasons have a great effect upon the period of sowing and so has the soil; for it may be so wet in February and March, as in the present season 1804, that few soils could be got in condition much before April. As a general rule, however, all cold soils and exposed situations should be sown as early as possible, while the more genial ones may be sown later.

Culture.—The seed having been harrowed in with the small tined harrows, the ground is afterwards rolled with a light roller. As soon as the rough leaves appear, and as they can be distinguished from weeds, the ground should be harrowed with the short but very sharp tined harrows one way, in a few days afterwards it should be hoed with a carot or three-inch hoe, cutting out the plants to about four inches asunder. In three weeks the ground should be again hoed with a six-inch hoe, cutting out every other plant, and hoeing all the ground clean. In a month harrow the ground over, which will loosen any old weeds, destroy the young ones, and by stirring the surface of the ground, let in the sun and air in order to strengthen the plants, and to prepare them for the last hoeing which should be in 15 days, when, with a nine-inch hoe, every other plant should be cut out, and the ground very clean and nicely hoed.

carots are, and being equally hardy, will keep through the winter sound. If it is required to keep them until April, they look them over in February, and wiping the sound ones quite dry and removing every defective one, they are repacked or piled in some fresh dry sand or straw, and covered close over so as to exclude all atmospheric air, when they will keep (as I have often seen) sound until the beginning of May.

Produce.—As these roots grow much larger than carots, it is not unusual for the growers about Mortlake, East Sheen, &c. to produce from 20 even to 30 tons per acre. Averaging however those which I have met with, it will amount to about 24 tons per acre.

Appropriation and consumption.—The fairest and finest roots are sent to the different markets in London, and some are reserved for seed. All the unsightly and lesser roots are given to horses, milch cows, calves, oxen, swine, and sheep. When given to the former they are sliced, and in small quantities, which is afterwards increased according as they appear to relish them. They do not, however, bestow so much trouble with hogs, as they will greedily devour them whole. Calves and sheep require to have them cut in pieces, particularly suckling ewes on account of their lambs, which soon become very fond of them, and to them they prove highly invigorating from the quantity of rich mucilage which is contained in the root.

HOPS. HUMULUS LUPULUS.

Dioecia hexandria. Linn. Sp. Plant.

There is but one species of this very interesting genus mentioned by any of our great botanical authors, and that is the one above-mentioned; but there are several seminal varieties produced by the care and diligence of some of the growers, the principal of which will be hereafter described. It is now more than two centuries and a half since this plant was first brought from Flanders into this kingdom, according to that memorable old saying,

> Hops, reformation, baize, and beer,
> Came into England all in a year.

As the county of Surrey stands at this day, and has for several years stood pre-eminent in the management and in the superior value of its hops, and as the parish of Farnham has been particularly conspicuous in creating this value, a concise history of the place and its soil may not be uninteresting.

Farnham, or as it is spelt in some ancient records Feornham, or Fernham, gives name to the and the decayed roots of fern (which are easily distinguished from the roots of any other plant) were still visible; and such soil, whenever it happens to be of good depth, is well calculated for the growth of hops.

The town stands on the banks of the Lodden, and was given by Ethelbald, King of the West Saxons, to the see of Winchester. There is a sort of castle and a palace, and here the bishops of that diocese have resided in the summer ever since the reign of King Stephen.

The town was formerly as much famed for the extent of its corn market as it is now for its hops; upwards of 2000 quarters of wheat having been sold there on a market day. As Guildford was, however, a more centrical situation, and consequently fitted for a corn market, the latter was rising daily into consequence, while Farnham was falling so fast to decay that the toll was considered of so little value, near two hundred years ago, as to induce the toll gatherer to sell his place for the trifling sum of 40*s*. a year. The market must, however, have increased very considerably after that period, because, towards the latter end of 1600 it amounted to the sum of £200 per annum. It must have been on the increase ever since, because I am well informed that a great deal of corn, and particularly wheat, and seeds, are weekly sold, but which, from the prevalent custom of selling by sample instead of exposing the bulk, does not appear to be the case.

Besides the more favourable situation of Guildford, improving as it was also by the introduction of a navigable river to that town, another event of great importance materially assisted in lessening the market for corn at Farnham. The clothing business had at one time been carried on there to a great extent, every part of the manufacture, such as spinning, weaving, combing, fulling, &c. being performed in and about the town, which disappearing, and the manufactures retiring to Wornersh and Godalming, must have so much lessened the consumption of bread corn, as to account, I think, almost of itself for the decay of the corn market.

I have endeavoured to trace the cause of the dissolution of this manufactory; but although I have many valuable friends and relations whose ancestors are to be found recorded among the residents of those days, yet nothing positive can now be ascertained; it is, however, pretty clearly understood, that the hop was first brought from Suffolk by one of the principal manufacturers, and planted by him as a crop near the town, which succeeding beyond expectation, induced other manufacturers

Having given these few preliminaries, I shall next detail the order and process of their cultivation, &c.

The soil in which the hop principally delights is a rich, strong, but mellow hazle mould, deep, and dry, or a deep silicious yellow loam. An impervious clay, or a soil that abounds in flints or large stones, a gravel, or a sand, are very unfit for this plant, although we find it cultivated in a portion of all these sorts of soils for want of better; but wherever that happens, not only the expences in improving and fitting such soil are greatly increased, but the care and attention is necessarily extended, while the chance of failure is not always lessened.

The situation of a hop plantation is not so particularly regarded at Farnham as might be supposed; indeed, so indiscriminate are they as to position, that they are to be found in all directions, and every other sort of plantation, and I may almost say cultivation too, has given way to them; but where a choice can be obtained, a southern aspect is preferred; at the same time care is always taken that it is as well sheltered as possible from the east, the north, and the west winds, that the frosts in the spring, or the storms in the summer do not affect them, or injure the full grown hop. The rows are set out so wide and open as to admit a free circulation of air between them, and to enable the grower the better to keep them thoroughly clean.

Sort.—The kinds of hop in cultivation and in the highest estimation, are the grape hop and the white bine, which are in general raised from nursery plants, which are cuttings of one year old.

The golden hop is in some parts of the county esteemed.

Preparation.—The land is always trenched for the reception of hops, and the ground in general planted immediately; but as that mode does not appear to me to be the most judicious, and as several of the most experienced planters have agreed with me in the idea I have suggested to them, it may not probably be amiss to introduce it here.

Having made choice of a spot of ground for the plantation, at least twelve months before you mean to plant, let the ground be regularly trenched two spades deep, as soon after the preceding crop is off as you can; let it lay in that state through the winter to sweeten and mellow until February, then pare down the front of the ridge facing the *south* or west, draw a drill along it, and sow some early Nicholas peas, or the forwardest sort that can be got, during the season they are to be regularly nip to be sown, for the reasons I have once before given, namely, that they may be got off the ground early; let them be twice hand hoed and folded off by the middle of November, which is quite as late as the latter sort can be kept good. Single trench the ground as fast as it is cleared, and lay it up in sharp ridges that the frost and weather may penetrate and pulverize it. The expence of trenching an acre of hop ground at Farnham, in the way it is usually done is £4; in the way I have proposed it would necessarily be increased, but the superior state and condition of it would more than compensate the apparent difference in the expence.

PLANTING.—About Holland tide, which is the beginning of March, they begin to put in the plants. Having staked out a line parallel with the hedge, in such a direction as will give the necessary exposure to the sun if possible, and at an ad libitum distance of from ten to 20 feet from it, and having a rod or pole of 16½ feet long, or what is better of 18 feet long, as being the exact distance of three holes, (but a Gunter's chain previously marked on the links with bits of cloth or rags is the most handy instrument,) put in a sharp short stick as a mark at each of these divisions. At every one of those sticks a hole is made two feet square and two feet deep, that the earth may be sufficiently loosened to that depth; but if it has been previously trenched as above described, it will be completely so, and in this instance not necessary. To each of these holes three nursery plants are put, the mould having been finely pulverized by the spade is thrown gently in about the roots which are to be carefully spread out, and the plants raised up above the natural level of the ground, so that a hill may be hereafter formed about them, the hole is then filled up to its proper height with the mould that came out of it. In the second row, the plants instead of being placed opposite those in the first row, are placed alternate which forms the triangle, and the third row being placed opposite those of the first row produces the quincunx, by which means the plants stand at greater distances, and have room for their branches, and what is not the least part of the advantage, the current of air becomes broken. In this manner, therefore, the whole field is planted. In the course of the season great care is taken to hand weed the plants, and to keep the intervals frequently hand hoed, and the weeds raked off; some of the planters instead of hoeing the intervals turn in the ground with the spade, burying the weeds as they proceed, putting some of the finest mould carefully therefore with a good pruning knife, a rag stone and a whetstone, (the former being the sort with which scythes are sharpened, in order to give them an edge, and the latter the blue stone which smooths the edge;) cut off the old shoots clean and smooth, within one or two inches of the main stem, and all the suckers quite close to it; the soil is then replaced sufficiently to cover the wounds, in order to prevent the air from affecting them just before the plant begins to spindle: one pole about 12 feet long is put to each plant towards the outside of the plant, with an inclination somewhat external. As the vine or bine shoots, it is gently twisted round the pole and tied sometimes with rush, sometimes with bass matting, &c.; the ground is kept stirred and made perfectly clean, either with the nidget, horse-hoe, hand-hoe, or spade, and in this year the produce will be from three to 400 pounds weight per acre.

In the autumn the ground is either dug over or ploughed, but many of the growers prefer the spring for this operation, under a persuasion that it keeps the plants backward and from springing so early.

The third year in the month of February, the ground is cerefully taken away from about the plants with a hop hoe, the vines are cut as before described, and a quantity of manure or dung, after the rate of 20 or 25 loads (according to its quality) to the acre, having been brought on the land in the course of the winter, the hills are moderately made and dressed with part of this manure in the month of March; after which, they are poled with poles of 16 or 17 feet long: great judgment is necessary in this operation, for if the vines are weak, and they happen through any inadvertence to be over poled, that is, that too high poles are set, the roots will be very much impoverished thereby, especially if the soil is not in prime condition and heart; the safer way therefore, is, upon all occasions, rather to under than over pole them, for should it be found that the vine grows stronger than was expected, either from the favourableness of the season or the superior quality of the manure, an auxiliary pole may always be added. In placing the poles, it is adviseable (as I before observed,) that the tops should incline somewhat outwards, since it is a notorious fact that a leaning pole will always have more hops than an upright one. From time to time, a little of the manure should be added to the hills during the summer, which, as it tends to keep them moist, serves also to invigorate them. Great care is taken to keep the plants as well as the ground free from assisting the rest of the plant, whose leaves are smaller and farther removed from the ground. Perhaps it may be proper (when from the strength of the plant, and the closeness of their rows, the lateral branches occupy the greater part of the intervals) to shorten some of the most luxuriant of those branches; but I am not clear (particularly as it respects the hop, one of the most tender and delicate plants that are grown,) whether it would not be more adviseable to destroy every other plant in the row, or even every other row in the plantation, and by that means to procure the wished for air, rather than by shortening the shoots and taking off the leaves, run the risk of a very hot season, or an occasional cold and drying one, of injuring the plants after such an operation, and giving perhaps a sudden check to the blossom before it is out of all danger. The only objection to this mode can be, that it may appear to lessen the quantity of the crop by the destruction of so many rows; but it remains to be proved whether those plants that are left, may not, from their superior and increased strength, produce hops nearly in as great abundance generally, but perhaps infinitely superior in particular seasons, and very far exceeding them in quality and value in every season.

If what is called the blast attacks them, the leaves are taken off as high as they can be reached; this operation is supposed to stop the further increase of this malady.

In August they begin to bell, that is to shew the seed vessel, and if the weather is favourable, they will be ripe by the end of the month or the beginning of September, when the seed begins to change from a pale straw colour, to a light brown, to emit a fragrant smell, to feel firm and to be easily pulled and rubbed to pieces, it is then a certain criterion that they are come to maturity, and fit for gathering.

Picking.—If the weather is dry, every possible exertion and expedition is used to get them picked, for a storm either of wind or rain would do irreparable injury; it is a scene of great bustle and much cheerfulness. The pickers, who are composed of men, women, and children of all ages, and brought together from a very-great distance, by the lucrativeness and pleasure of the employment, at a very heavy expence to the planter, enter upon and go through their task with an hilarity that best bespeaks their ideas of the occupation.

It is thus done, first, they cut the vines about three feet above the ground, much lower is considered to be injurious to the root by the profuse so in order to enable them the better to do it, they not only set out all those that are fresh ripe for the first gathering, but make such distinctions in the appearance of their respective qualities as in their judgment seems most proper, the full, fair, handsome, and most fragrant making one assortment, the next fairest a second assortment, and so on with a third, fourth, &c. until they are all picked. Such being the practice with them, it would seem to require, not only the most minute attention, but the most discriminating judgment on the part of the planter, at this critical period, to arrange those assortments skilfully, and to prevent their being mixed and rendered of less value. And shall the tithing man go into this man's garden, and instead of taking the tenth hill to do with what he pleases, take the tenth basket, the effects of the planter's superior skill and judgment in this arrangement, in addition to that which he has exerted and produced as a grower? Does he go into the manufactory of the renowned Messrs. Bolton and Watt, of Soho, or that of Messrs. Wedgewood, or any other great manufactory in the kingdom, and take indiscriminately the tenth of their manufactures? If he does not, is not that law which confines the tax to the productions of the earth barbarous and impolitic? Does not the manufacturer of iron, of glass, of earthen ware, of woollen, linen, the timber dealer, or any other profession receive as much benefit from the church as the farmer? while, therefore, the latter is paying as in this instance, ten per cent upon his capital, with another five per cent at least upon his skill, to the support of that church, or rather, as in truth it is, to an overgrown layman, the former pay perhaps less than the thousandth part of one per cent upon their capital and industry towards the same church, when they, in fact, can better afford to pay the larger tax than the farmer can the lesser one. We must, therefore, never talk of the situation of other countries while such a curse as this exists in our own. But to return; in the several pickings which are made, those which are of a bright yellow colour are those which are properly ripe, and are the prime; those which have a greenish cast are the unripe, and are found at the tops of the poles and at the extremity of the branches of the ripe ones, on the shady sides of the plantation, and those which are near the hedges; and the brown are the over-ripe ones. The bin is frequently emptied in the course of the day into large baskets or bags, which are carried immediately to the oast-house or kiln to be dried, to and which knowledge they have acquired by long practice, without knowing the use of that instrument. The hops are laid five or six inches thick upon a hair cloth, the fire is kept to one uniform but moderate degree of heat, (which appeared to me to be about 60° of Farenheit.) When they think that the one side is nearly dry, and find it necessary to turn them, they do it before they sweat, that they may not burn, nor become discoloured. Before, therefore, they turn them, they lower the fire so that they may cool a little, which when that has taken place, they turn them carefully over, and again increase the fire to its proper temperature. They are sufficiently dry when the involucrum or leaves of the hop readily fall off, and the stalk which supports the umbel becomes brittle. In general, eight or ten hours will dry a kiln. As soon as they are dry they are laid on the floor in a heap, where they will undergo a sort of sweating, which as soon as it is discovered they are said to be fit for

Bagging, which is done in the following manner: A round hole from 25 to 30 inches diameter is made in the floor of the room, where the hops are laid after coming from the oast. A handful of hops is put into the two corners of the bag, which is tied tight with packthread or rope-yarn. The mouth of the bag is spread open by a hoop to which it is made fast, and somewhat larger than the mouth of the hole in the floor upon which it rests; the bag being thus suspended through the floor, and hanging perfectly independent of the floor below, a bushel or two of hops are put in, and a man gets into the bag with flat shoes, and treads the hops regularly and closely down, the tighter and closer the better; this operation is repeated by putting in a few hops at a time, for the more easily and close pressing, until the bag is full, for it is to be observed that the firmer they are packed the longer they will keep. When that is done, the hoop is loosened, the bag is let down, more hops are put into the upper corners of it, and the bag is sewed up as close as possible.

They must be kept in a dry place, and free from vermin.

Produce.—The third year they are supposed to yield a crop, and upon an average will produce from six to eight hundred weight per acre. Upon a pretty accurate calculation of the average produce of the best old plantations for the three years ending with Christmas 1802, they have yielded a return of from £45 to £50 per acre, which, when all the expences and charges hereafter enucise, together with all the other charges, will prove the destruction of a great many plantations at this place, and in other parts of this county, as well as in Kent and Sussex.

The following are the Charges attending the Farnham Hop Plantations.

	Average.		
Rent from £3 to £10 10*s*. Average per acre about	£6	0	0
Tithe composition from £2 to £3; according to the quality of the land per acre	2	10	0
Poor's-rate from 4*s*. 3*d*. to 9*s*. 6*d*. Rack-rent in the pound for the last four years	0	6	4
Dung from 20 to 25 loads every other year; say 12 loads, per acre per annum	6	6	0
Spreading dung, per acre	0	2	6
Delving, per acre	0	13	4
Opening the hills, and cutting in March, per acre ...	0	5	0
Sharpening the poles at 8*d*. per 100, or per acre	0	9	0
Poling, per acre	0	7	0
Throwing of stacks, and laying out the poles, per acre	0	7	0
Tying, per acre	0	8	0
Becking, per acre	0	7	0
Half hilling, per acre	0	2	6
Whole hilling, per acre	0	7	0
First hoeing 3*s*. 6*d*.; second hoeing 2*s*. 6*d*. per acre ..	0	6	0
Stripping bines, and stacking poles, per acre	0	7	0
Sundry jobs during the year, in moving poles and binding, per acre	0	7	6
Drawing the poles the third year to the ground, 5*s*. per 100, or per acre	3	10	0
Poles, per acre	18	18	0
Drying, per week 21*s*. or per acre	0	3	6
Bagging, per acre	0	5	4

The following Implements and Buildings are indispensably necessary upon every large Hop Ground.

A hop bar 4½ feet long, the lower part for about 18 inches high, made square like a poker to make the poles for poling	£0	7	0

A spade with three spanes or prongs 18 inches long, to delve the ground	£0	5	6
A beck-hoe, which is a hoe on one side and two spanes on the other	0	4	6
A ten-inch common hoe to clear the weeds	0	2	6
A fourteen-inch common hoe to hill the grounds	0	3	6
One dozen picking baskets, at 6*s.* each	3	12	0
A pair of scales, and weights, &c.	5	0	0
10 frames or bins to 6 or 8 acres, at 3*s.* 6*d.*	1	15	0

A shed in the ground to secure and keep the poles dry in winter, and to pick the hops in during a catching autumn, according to the size, from £40 to £60.

An oast-house or kiln for drying the hops, with wareroom, the building about 18 feet square, will cost from £200 to £250 according to the sort of materials made use of, and the difference in the value of labour.

When there is no shed to receive the poles they are sometimes piled in the field pyramidically in the following manner. Set up six strong poles in a circular form with the ends fixed in the ground, and the tops inclining to each other, they are then say how necessary it was to have only one kind of hop in a plantation, and having made choice of that sort, the best way to have strong plants is, by following the practice of nurserymen, and laying down the superfluous lower shoots; first twist the shoot at the bud or joint that is to be buried in the ground, and having secured it there by a small peg, cut off the top of the shoot about one or two buds above ground. As soon as you find it has taken root, cut it asunder from the parent bine, and leave it to itself by tying it to a short stick, when it will be a strong plant by autumn, fit to be removed into the fresh plantation, and will gain one year at least of the best cutting.

In POLLING it is advisable to make three holes to each hill, one to the east, another to the north, and the third on the west side of it, that all the hops in their progress towards perfection may better receive the benign influence of the south sun.

In proportion as the weather is more or less kind, the utmost circumspection is taken by the planter in gathering or picking his hops, for if he suffers them to be over-ripe before they are gathered, they will shed their prime seeds, in which the chief strength of the hop consists; neither can it be expected that they will look so green, on the contrary, they will have contracted so much brown as to diminish their value considerably. It is, therefore, infinitely better to pick the hops somewhat before they are ripe, rather than run the risk of having them over-ripe. There is, however, a loss in the weight of the one greater than in the other; for example, four pounds of hops thoroughly ripe, but not dried, will yield about one pound of hops when dry; but it will take five pounds, at least, of hops not quite ripe, though in their full prime, to make the same weight when dried.

The only reason why brown hops are less esteemed, as far as I can learn, than the pale, is, because the former can only be used for high coloured beer, while the latter is always used for pale beer, and therefore most esteemed. The same precaution as I have before said is necessary in the drying of them, for if any are not sufficiently so, it is well known both to the factors and to the brewers, that a handful or so of under-dried hops will injure, if not spoil, many pounds of others, by taking away their fine flavour as well as colour.

It seems to be admitted by the best planters, that charcoal, whether made from the old poles, or from the stubs of trees or bushes that have been smoke, a portion at least of their flavour and colour to the hops, and consequently make them of little value.

I have learnt that it had been the practice with some growers to introduce a small quantity of brimstone on the fire when the hop was first placed on the kiln, with a view to evaporate the moisture more speedily, to destroy any insects that might be among the hops, and to give them a brighter colour. With whatever intention such a practice might be designed, and it is known to most of the Farnham planters, from some of whom I received my information, it appears to be entirely laid aside, under a conviction that all such measures militate against the act of the 7th of Geo. II. cap. 19, which declares, "that if any person shall mix with hops, any drug or ingredient to alter the colour or scent, he shall forfeit five pounds per hundred weight. Upon this statute, 35 Geo. III. King v. Pack, the defendant was convicted in the penalty of five pounds, for putting into the fire, by which one hundred weight of hops were drying, a quantity of sulphur and brimstone to alter the colour thereof; the vapour and fumes of which ascended to the hops placed over such fire, and they being there in a moist state, fixed to them and made them appear brighter. Lord Kenyon, C. J. was clearly of opinion that this is an offence within the meaning of the Act of Parliament, and the conviction was affirmed."

There are many salutary provisions against fraudulent practices in the management and arrangement of hops, a few of which I intend hereafter to detail; and for the rest, I must refer the reader to Burn's Justice, under the article Hops, among the Excisable commodities, page 117, in the IId. vol. of the 19th edition.

The bags in which hops are packed at Farnham are made of a coarse linen cloth, but in general of a better quality, and more white than is used at other places, it is known by the name of Canterbury pocketting; these bags are commonly eleven feet long, and nearly two yards and a half in circumference; they contain about two hundred weight and a half of hops. The smaller bags called pockets, are much used by the Farnham planters, into which their prime hops are put, and contain from 140 to 150 pounds weight.

An acre of hops will take about 3000 poles, and it is customary to buy in about 500 fresh ones per acre per annum, to supply the place of those which fail, and to keep up the stock; they are well supplied with them, although very few are me to make every inquiry among the most sensible planters, which the nature of the subject seems to demand; but notwithstanding it appears evident that some grounds are more liable to some or most of these diseases than others, and that those grounds are often brought from the highest state of luxuriance and vegetation to the very brink of destruction, yet do these planters seem to suffer these things from year to year without endeavouring to discover the cause, to arrest the progress, or to extirpate the disease. If then planters interest themselves in so small a degree on those very important points, and if they, who from their occupation have so many and frequent opportunities of noticing these diseases in their several stages, should at this time of day be as ignorant about the cause or the cure as they were fifty years ago, it will not be expected from me to offer any thing conclusive, but to suggest the means by which the subject may be examined with ease, and which, if carefully attended to, cannot fail of bringing some very interesting truths to light. Of the usual diseases incident to hops, I have no question but they are brought on by a succession of gloomy days, by cold showers succeeding to violent heats, too moist a constitution of the air, a sour bad understratum of soil, the intervals between the rows being of a different soil from the hills, and never properly worked or dug, (by which means the roots become suddenly checked and confined,) uncleanliness and contagion, and the want of a free circulation of air.

As it is necessary in considering these subjects to go on with some regularity, I propose to proceed in the order in which either the insects or the diseases are usually found to attack the plant. In treating of the latter, I shall refer to some very accurate details which are to be found in the Rev. Dr. Hale's Statical Essays, fol. 31, as being the best account I have ever met with; and with respect to the insects, they are such as I have proved to be true, and some of them no where noticed by any author that I have seen.

The WIRE-WORM may truly be said to be the first insect that infests the hop garden, his depredations are begun during the winter, and while the plant is in an inactive state; and the destruction which he causes is so truly alarming as to create a very considerable failure among the plants which are thus devoured at the root. In a garden of six acres planted two years ago, which had taken well, and was in a flourishing condition, out of 1200 hills in each acre, full one-third of the plants have been actually destroyed by this insect. As the soil was perfectly dry, and as these insects were found about the roots of many of the plants that were destroyed this spring, and as no others were found so circumstanced, I think it fair to conclude that they actually did the mischief. Very few plantations, old or young, in Surrey, Kent, or Sussex, have this winter escaped them, and there are probably more blank poles than were ever known.

The FLEA is the first insect that attacks the hop in any serious manner above ground. It commences its alarming operations almost as soon as the bine begins to run, and to be furnished with young and tender leaves, and having devoured these, it follows the growth of the plant, leaving the old and resorting to the fresh ones. It makes its attack during the day on the under side of the leaf, and but very seldom on the upper side, perforating it and filling it with holes like a sieve, and much in the same manner as the fly does the turnip. As they are very numerous, their devastations become presently visible, and this season, in the month of May, there were myriads of them in each of the several gardens I examined, and as the plants were later in shooting, and the bine weaker than usual, and as the weather proved cold, harsh, and dry, such perforations could not fail to check the growth of the plant, although it does not appear at this time, 23d of June, that the injury has turned out so serious as might have been expected; and this confirms my former opinion with regard to turnips, that rain accompanied by warm weather will repair the injury sustained by the leaves although nothing but the membranes shall be left, when a continuance of dry, cold, and frosty nights will as assuredly destroy every one in that state.

I see no immediate remedy against these formidable attacks, because these little creatures hop and jump with surprising agility from leaf to leaf, and from plant to plant; but it might be worth consideration how far Scotch snuff could be admitted through the medium of a large hair-dresser's puff; the smallest quantity would be sufficient, and the only question, perhaps, would be how far the expence of the cure may be commensurate with the evil. But if the application of snuff should be found objectionable on the score of expence, there cannot be the same objection to quick lime reduced to powder in a mortar, or by any other process, where its volatile and caustic parts might not be impaired. This powder applied to the plant through the same machine in the morning as soon as the dew is off, and the leaves are perfectly dry, the weather calm, or in a still evening, would, I verily believe, destroy those fleas which it might lodge upon; would prevent their settling there again very soon, and would give such a degree of stimulus to the ragged and half devoured leaves, as to produce such a rapid growth as probably might save them during the remainder of the season.

This insect is to all intents and purposes of the house-flea kind (pulex irritans, Linn.) in size and action, but differs from it in one essential character, viz. in being furnished with wings, but which, however, I never saw them use, although they are visible to the naked eye when the flea is dissected; whereas, the house-flea has none at all. They are also of a lucid dark green colour, but the common flea is a dark purple approaching to a black colour. The number of their legs seems common to them both, viz. three pair, and these formed for leaping. The particular genus and species of this insect I could not readily make out, for I never could catch one sufficiently perfect to distinguish the characters, being in general very much squeezed and bruised in catching. It is, however, no otherwise material than that the real knowledge of the insect would enable us to know the several transformations it goes through, and from thence to form some opinion as to the probability of destroying them in their ovarious state.

I observe that since these insects have left the hops, with the exception of a few, they are succeeded by a small fly, (musca, Linn.) of a less size than the garden, or what is usually called the spring fly; it is possible, however, that they may not be arrived yet at their full size, and consequently so far imperfect; but as I frequently observed them in the act of copulation, I had some reason to conclude that they were mature and full grown. These were also in the act of perforating the leaves with their little trunks, so that although their number was not so great as to create any alarm, yet it appears that the hop, like the animal species, is a prey to insects or disease from the period of its birth to its final decay.

The old leaves of the plant thus perforated curl downwards, the upper surface looks dingy, of a dead colour, and feels stiff, as if the juices thereof had been extravasated, and left them perfectly dry. The less perforated ones exude a thick viscous juice, which, if not removed by rain or strong dews, necessarily invite fresh insects to the feast, who continue to suck out the remaining juices until the vital part of the leaf is destroyed; and as leaves are as essential to the well doing and growth of the plant as the roots, the more they are injured, the less healthy the plant will become.

If these fleas continue their depredations for any length of time in any large bodies, the plant seldom properly recovers the attack, and the crop is conjectured to turn out very bad. Some farmers have assured me that they are brought by particular blighting winds, and that those grounds are most subject to them which are open or decline to the north and north-east; but as I do not take every thing for granted that I hear, I made it my business to look into every hop garden I saw, which comprised almost every aspect and every position, and for several miles, and I could see no difference or advantage that the one had over the other as to this insect; for there were some entirely free, others partially so, and some very bad, in the same directions and with similar shelter.

I am indebted for the first hint about the *flea*, to my friend Major Cranston, of Eastcourt, to whose inspection I had submitted this among other papers of this survey, and I am happy in this opportunity of bearing testimony to the great attention which he pays to agriculture, and the uniform success that has hitherto followed, and will unquestionably follow such laudable exertions.

His hop garden is always kept neat and in high condition, and having his unrestrained permission to visit it, and any part of his farm whenever I please, I have collected a great deal of information carried it out of the hop ground into a full open exposure; these imbibed and perspired as much more as the former in the hop ground; which is the reason why the hop vines on the outside of gardens where most exposed to the air, are short and poor in comparison of those in the middle of the ground; viz. because, being much dried, their fibres harden sooner, and therefore they cannot grow so kindly as those in the middle of the ground, which by shade are always kept moister and more ductile.

" Now there being 1000 hills in an acre of hop ground, and each hill having three poles, and each pole three vines, the number of vines will be 9000, each of which imbibing four ounces; the sum of all the ounces imbibed in an acre in twelve hours (day) will be 36,000 ounces = 15,750,000 grains = 62,007 cubic inches, or 220 gallons; which divided by 6,272,640, the number of square inches in an acre, it will be found, that the quantity of liquor perspired by all the hop vines, will be equal to an area of liquor as broad as an acre, and $\frac{1}{101}$ part of an inch deep, besides what evaporated from the earth.

" And this quantity of moisture in a kindly state of the air is daily carried off in a sufficient quantity to keep the hops in a healthy state; but in a moist state of the air, without a due mixture of dry weather, too much moisture hovers about the hops, so as to hinder in a good measure the kindly perspiration of the leaves, whereby the stagnating sap corrupts, and breeds mouldy fen, which often spoils vast quantities of flourishing hop grounds. This was the case in the year 1723, when 10 or 14 days almost continual rains fell, about the latter half of July, after four months dry weather; upon which the most flourishing and promising hops were infected with mould or fen in their leaves and fruit, while the thin, poor, and unpromising hops escaped and produced plenty; because they being small, did not perspire so great a quantity as the others; nor did they confine the perspired vapour so much as the large thriving vines did in their shady thickets.

"This rain on the then warm earth made the grass shoot out as fast as if it were in a hot-bed; and the apples grew so precipitately, that they were of a very flashy constitution, so as to rot more remarkably than ever were remembered.

"The planters observe, that when a mould or fen has once seized any part of the ground, it soon runs over the whole; and that the grass and other herbs under the hops are infected with it.

"Probably because the small seeds of this quick growing mould, which soon come to maturity, are blown over the whole ground; which spreading of the seed may be the reason why some grounds are infected with fen for several years successively, viz. from the last year's fen: might it not then be adviseable to burn the fenny hop vines as soon as the hops are picked, in hopes thereby to destroy some of the seed of the mould.

"Mr. Austen, of Canterbury, observes fen to be more fatal to those grounds that are low and sheltered than to the high and open grounds; to those that are shelving to the north than to those that are shelving to the south; to the middle of grounds than to the outsides; to the dry and gentle grounds than to the moist and stiff grounds. This was very apparent throughout the plantations where the land had the same workmanship and help bestowed upon it, and was wrought at the same time; but if in either of these cases there was a difference, it had a different effect; and the low and gentle grounds that lay neglected were then seen less distempered than the open and moist that were carefully managed and looked after.

" The honey-dews are observed to come about the 11th of June, which by the middle of July turn the leaves black, and make them stink.

" FIRE-BLASTS.—I have in July (the season for fire-blasts as the planters call them) seen the vines in the middle of a hop ground all scorched up, almost from one end of a large hop ground to another, when a hot gleam of sunshine has come immediately after a shower of rain; at which time the vapours are often seen with the naked eye, but especially with reflecting telescopes, to ascend so plentifully as to make a clear and distinct object become immediately very dim and tremulous. Nor was there any dry gravelly vein in the ground along the course of this scorch. It was therefore probably owing to the much greater quantity of scorching vapours in the middle than outsides of the ground, and that being a denser medium it was much hotter than a more rare medium.

" And perhaps the great volume of ascending vapour might make the sun beams converge a little toward the middle of the ground, that being a denser medium, and thereby increase the heat considerably; for I observed that the course of the scorched hops was in a line of right angles to the sun beams about eleven o'clock, at which time the sun beam was: the hop ground was in a valley, which ran from south west to north east, and to the best of my remembrance there was but little wind, and that in the course of the scorch; but had there been some other gentle wind, either north or south, it is not improbable but that the north wind gently blowing the volume of rising reek on the south side of the ground, that side might have been most scorched, and vice versa.

"As to particular fire-blasts which scorch here and there a few hop vines, or one or two branches of a tree, without damaging the next adjoining; what astronomers observe may hint to us a no very improbable cause of it, viz. they frequently observe (especially with the reflecting telescopes,) small separate portions of pellucid vapours floating in the air; which, though not visible to the naked eye, are yet considerably denser than the circumambient air, and vapours of such a degree of density may very probably either acquire such a scalding heat from the sun as will scorch such plants as they touch, especially the more tender: an effect which the gardeners about London have too often found to their cost, when they have incautiously put bell glasses over their cauliflowers early in a frosty morning, before the dew was evaporated off them, which dew being raised by the sun's warmth, and confined within the glass, did there form a dense transparent scalding vapour, which burnt and killed the plants. Or perhaps, the upper or lower surface of these transparent separate flying volumes of vapours may, among the many forms they revolve into, sometimes approach so near to a hemisphere or hemi-cylinder, as thereby to make the sun beams converge enough, often to scorch the most tender trees, in proportion to the greater or less convergency of the sun's rays.

" The learned Boerhaave in his Theory of Chemistry, Dr. Shaw's ed. p. 245, observes, that those clouds which appear in summer time, are, as it were so many mirrors, and occasion excessive heat. These cloudy mirrors are sometimes round, sometimes concave, polygonous, &c.; when the face of heaven is covered with such white clouds, the sun shining among them, must of necessity produce a most excessive heat; since many of his rays, which would otherwise, perhaps, never touch our earth, are hereby reflected to us; thus, if the sun be on one side, and the clouds on the opposite one, they will be perfect burning glasses.

" I have sometimes (continues he) observed a kind of hollow clouds, full of hail and snow, during the continuance of which the heat was extreme; since by such condensation they were enabled to reflect much more strongly. After this came a sharp cold, and then the clouds discharged their hail in great quantity, to which succeeded a moderate warmth. Frozen concave clouds, therefore, by their great reflections, produce a vigorous heat, and the same when resolved excessive cold.

" Whence we see that blasts may be occasioned by the reflections of the clouds, as well as by the above-mentioned refraction of dense transparent vapours.

" In the very wet and cold year 1725, most things were a full month backwarder than usual. Not half the wheat in by the 24th of August, in the southern parts of England; it was, however, pretty plenty, though coarse, and long straw; barley coarse, but plenty of it in the uplands. Hops were very bad through the whole kingdom, and it seems that they fared better at Canterbury than they did at Farnham and other places. The following, however, was the state of the plantations there:

"At Mid-April not half the shoots appeared above ground, so that the planters knew not how to pole them to the best advantage. This defect of the shoot, upon opening the hills, was found to be owing to the multitude and variety of vermin that lay preying upon the root; the increase of which was imputed to the long and almost uninterrupted series of dry weather for three months past: towards the end of April many of the hop vines were infested with the flies. About the 20th of May there was a very unequal crop, some vines being run seven feet, others not above three or four feet; some just tied to the poles, others not visible; and this disproportionate inequality in their size continued through the whole time of their growth. The flies now appeared upon the leaves of the forwardest vines, but not in such numbers here as in most other places. About the middle of June the flies increased, yet not so as to endanger the crop; but in distant plantations they were exceedingly multiplied, so as to swarm towards the end of the month. June 27, some specks of fen appeared; from this day to the 9th of July, was very fine weather. At this time when it was said that the hops in most other parts of the kingdom looked black and sickly, and seemed past recovery, ours held it out pretty well in the opinion of the most skilful planters. The great leaves were indeed discoloured, and a little withered, and the fen was somewhat increased. From the 9th of July to the 23d the fen increased a good deal, but the flies and lice decreased, it raining much daily. In a week more the fen, which seemed to be almost at a stand, was considerably increased, especially in those grounds where it first appeared. About the middle of August, the vines had done growing both in stem and branch, and the forwardest began to be in hop, the rest in bloom; the fen continued spreading where it was not before perceived, and not only the leaves, but many of the burrs also were tainted with it. About the 20th of August, some of the hops were infected with the fen, and whole branches corrupted by it. Half the plantations had hitherto pretty well escaped, and from this time the fen increased but little: but several days violent wind and rain, in the following week so disordered them, that many of them began to dwindle, and at last came to nothing; and of those that then remained in bloom, some never turned to hops; and of the rest which did, many of them were so small, that they very little exceeded the bigness of a good thriving burr. We did not begin to pick till the 8th of September, which was 18 days later than we began the year before. The crop was little above two hundred on an acre round, and not good. The best hops sold this year at Wey-hill fair for sixteen pounds the hundred.

In page 83 he says, "I have often observed from these thermometers, (which were Fowler's,) when that kind of hovering lambent fog arises (either mornings or evenings,) which frequently betokens fair weather, that the air which in the preceding day was much warmer, has upon the absence of the sun become many degrees cooler than the surface of the earth; which being near 1500 times denser than the air, cannot be so soon affected with the alternacies of hot and cold; whence it is probable, that those vapours, which are raised by the warmth of the earth, are by the cooler air soon condensed into a visible form. And I have observed the same difference between the coolness of the air, and the warmth of water in a pond, by putting my thermometer, which hung all night in the open air in summer time, into the water, just before the rising of the sun, when the like reek or fog was rising on the surface of the water.

"I have several times observed, that when the fumes of burning brimstone have ascended among the leaves of a tree, those leaves have very soon withered; and that, not by any scorching heat of those fumes, for the burning brimstone was at too great a distance to have that effect: whence it seems probable that these fumes fix and destroy the elastic principles in the leaves: and query, may not some blasts be owing to the like effects of volumes of sulphureous vapours which may float in the air?"

From the foregoing passages, it will appear that these diseases called the fen, the mildew, and the fire-blasts, are more prevalent in certain seasons, in which, certain plantations in particular situations, and under certain modes of cultivation, uniformly suffer most. With respect to the two former, perhaps, what the learned Pleneiz in his Treatise on Diseases, in speaking of the scarlatina, may not be unapplicable, when he says, "whether this disease be caused by animalcula capable of generating their species, or by certain miasmata which have the property of assimilating other particles of matter to their own nature, by some mode of fermentation hitherto but little understood, there can be no doubt but they are contagious, and perhaps so in a degree nearly equal to the small pox and measles." 243 Pleneiz de Scarlatina.

As with diseases of the body so it is with vegetables, that the cleaner every thing is kept, the less virulent and durable will be the disorder; and although in the instance of the blast here recorded, the ground that was full of weeds and backward, succeeded beyond that which was clean and forward, yet we have a proof in another case, that the weeds were equally infected with the fen as the hops, and consequently were the means of increasing and retaining the disease.

I have already said that stripping the plant of its leaves is an injudicious plan, and in particular seasons, and even in particular sorts of weather, will be certain of generating some disease. In another place Dr. Hales says, "the full proof of the experiments which he has detailed in his work, of the serviceableness of the leaves in drawing up the sap, and the care we see nature takes in furnishing the twigs with plenty of them, principally near the fruit, may instruct us on the one hand, not to be too lavish in pruning them off, and to be ever mindful to leave some on the branch beyond the fruit; for we well know from experience, that to take off all the leaves in a particular season, would endanger the killing the branch or plant. There is another very considerable use in the leaves, viz. to keep the growing fruit in a ductile, supple state, by defending it from the sun and drying winds, which, by toughening and hardening its fibres, spoil its growth when too much exposed to them; but when full grown, or near it, in a dull backward season, a little more sun is often very needful to ripen it, it is then only that we can admit of a dispoliation of any of the leaves. In hotter climates fruits want more shade than in this country, and here too more shade is needful in a hot dry summer than in a wet cool one." Again he says, it may not be amiss to try whether the too great luxuriancy of a plant or branch may not be much checked by pulling off some of its leaves, which, I think, clearly proves that this great man was firmly of opinion, that the leaves of plants were absolutely necessary, not only to keep them in a state of luxuriance, free from disease, but essential towards the due perfecting the fruit.

The celebrated Dr. Ingenhousz has proved from a variety of experiments, that the largest and most perfect leaves yield more and purer dephlogisticated air than those which are not yet full grown; because, the young leaves have not their organization complete for the office to which they are destined, and therefore they are not yet able to elaborate so much, nor so good dephlogisticated air as the old ones. These experiments are very satisfactorily explained in Sect. XVIII. p. 272.

In another part of his work he says, it seems to be probable, that the leaves with which the most part of plants are furnished during the summer in temperate climates, and perpetually in hot countries, are destined to more than one purpose; such a great apparatus, which nature displays as soon as the sun begins to afford a certain degree of warmth upon the surface of the earth, can scarcely be considered as solely destined either to ornament, to nourishment of the plant, to its growth, to ripen its fruit, or for any other peculiar and single use. It seems probable, that they are useful to the growth of the tree, for, by depriving the tree of all its leaves, it is in danger of decay. By taking a considerable part of the leaves from a fruit tree, the fruit is less perfect; and, by taking them all away, the fruit decays and falls before its maturity. It is also probable, that the tree receives some advantage from the leaves absorbing, by their means, moisture from the air, from rain, and from dew; for it has been found a considerable advantage to the growth of a tree, to water the stem and the leaves now and then.

Plants have a power to correct bad air, and to improve good air. Winds will blow away the noxious particles of the air, and bring on air corrected by the waters of the seas, lakes, rivers, and forests. All these causes exist equally in the winter, as in the summer, or at least nearly so. The influence of the vegetable creation alone ceases in the winter; but the loss of this influence is, perhaps, more than counterbalanced by the diminution of the general promoting cause of corruption, viz. heat. Every body knows, that warm weather hastens in a great degree putrefaction. In the summer time numberless insects are produced, which did not exist in the winter: these insects infect the air by the corruption of their bodies. That immense quantity of animal substances, and many others, which undergo a putrefaction by the warmth of the weather, seems to require an additional power or agent to counteract it, and this office is destined to the leaves. By destroying or pulling off the leaves we remove this agency, and thereby increase the quantum of foul air, which we have seen already tends to create numberless diseases. Since, therefore, leaves are necessary to correct the foulest air, and it seems that they enjoy this privilege only in the day time, and when they grow in unshaded places, it follows, that whenever the plants in the rows, and between them, are so close together, (owing to a mistake in the first instance, or to an extraordinary, or even moderate degree of luxuriance) instead of purifying the air, they greatly contaminate it, and which the smallest check would not fail to bring on numberless diseases. I could not but be sensible of this in walking through several plantations last summer, the extreme luxuriance of which, and the intense heat of the day, had produced so copious a discharge of the perspiring matter, and the grounds being closed on all sides by high fences, which prevented a free circulation of the air, as to cause a very uncommon sensation at first entering them, something similar to that which I have a hundred times experienced in going into a hothouse early in the morning, when the preceding day had been very hot, and the house had been cooled, and refreshed with a plentiful watering the same evening, before it was close shut up for the night; but especially a peachery; the oppression upon the lungs is then very sensibly felt, and to asthmatic people it is dangerous. Dr. Priestley observed this remarkable offensiveness of the hothouse with a more philosophical attention; he tried the air within them, and found it worse than common air.

To sleep under the shade of a thick plantation of hops in the day time, in the highest state of luxuriance, would almost terminate in the death of the party, without any previous illness, and without people suspecting that it could be in any way dangerous; but it is really so, because the air issuing out of the plants in great abundance in the day time, is specifically heavier than common air, and is therefore inclined to remain longer among us. It is not so in the night, because whatever exhalations are discharged then, being specifically lighter than common air, they rise at the same time up, and which is perfectly visible on a hot summer's evening, and thus the lower region, in which we breathe is freed from them almost as soon as they are produced.

If, therefore, I have failed to convince the planter that the taking off the lower and larger leaves from the hop tends to vitiate the air, and to bring on those diseases to which that plant is liable, and that the planting them too close together has the same or nearly the same tendency, I must refer him to that very elaborate work of the celebrated Bonnet of Geneva, entitled Rècherches sur l'usage des fueilles dans les Plantes, et sur quelques autres sujets relatif à l'histoire de la vegetation, par Charles Bonnet, a Gottingen et Leiden, 1754, where he will find his curiosity strongly excited, and his conviction made complete.

The fly is nearly, if not quite the same insect which makes such terrible destruction among beans, and is usually called the black dolphin. To those planters whose grounds are well supplied with water, it would be a most excellent plan to make use of two or three of those garden engines which were invented by my late father, and were originally made by Mr. Cole, near Westminster bridge, and of late years with much credit, by Mr. Phillips, (who was formerly his partner,) of Blackfriars bridge, in Surrey; these may be wheeled through the plantations of an evening, and those hops which are discovered to be in the least degree infected by the fly, should have the engine played against their leaves and shoots with as much force as possible, the water being made to fall fine against them like rain, which may be easily done by applying the point of the finger over the nozel of the engine; this application repeated a few times, will effectually remove this troublesome insect, and greatly invigorate the plants; the expence is but trifling, and well worth the trial.

Besides, those plantations of hops that are to be met with at Farnham and that neighbourhood, there are many small hop gardens scattered over the county, such as at Limpsfield, Oxted, Tandridge, Godstone, Crowhurst, Lingfield, Horne, Burstow, Horley, &c. &c. But although the collected quantity grown in these several parishes may amount to a considerable bulk, yet I am not clear whether the public are not great losers thereby, because I have scarcely seen one farm, where the greater part of the man's capital, his manure, and his attention was not bestowed upon his hop garden, to the utter ruin of the rest of his farm, which is always foul and always neglected. And if the farmer has a lucky hit or two, it increases his ideas of speculation, and he enlarges his garden, instead of employing his new capital to the improvement of the other part of his farm.

I have endeavoured to acquire some knowledge of the growth and value of hops in this kingdom at different periods. I should have liked to have confined myself to the produce of the county of Surrey, but having applied to the excise office in London for information, they did not chuse to furnish me with any, and I must have contented myself only with having intended to furnish the public with such account, but for the kindness of some eminent factors in the borough of Southwark, particularly Messrs. Broadley's, who very civilly interested themselves, and sent me the following particulars; and as these several accounts from my friends tallied as nearly as possible, I have reason to believe them tolerably correct.

In the four years of 1719 to 1722, the growth and price of hops in the kingdom were as follows:

	Bags.		*s.*		*s.*	
1719	90,317	sold from	80	to	90	per cwt.
1720	38,169		56		65	
1721	61,362		35		56	
1722	49,433		35		56	
	4)239,281	bags	4)206		4) 267	

In the four foll

			s.
1746	93,000		6
1747	60,000		7
1748	87,000		4
1749	50,000		14
	4)290,000	bags	4)31
average growth	72,500		77

In the four follo

	Bags.	£	*s.*		£	*s.*	*d.*
	Brought up	23	11		24	12	
1801	185,000	4	10		5	0	
1802	11,500	9	0		10	0	
	4)308,500 bags	4)37	1		4)39	12	
average growth	77,125	9	5	3*d.*	9	18	0
					9	5	3
					2)19	3	3
					£9	11	7½

average £9 11 7½

The net duty on hops paid into the Exchequer for 35 years, ending A. D. 1753, amounted to £1,891,981, or £54,056 per annum nearly. For 30 years, ending A. D. 1802, amounted to £2,895,979 17*s.* 4*d.* or £96,532 13*s.* 2¾*d.* per annum.

From the above statement it will appear, that the duties paid upon hops have increased in nearly the same ratio with the average price; for in the first four years which I have taken notice of, the average price was, £2 19*s.* 1½*d.* The second four years which brings us to 1749, and makes 30 years, was, £4 6*s.* 9*d.* duty £54,056. The last four years, which brings us down to the present period, and which I am obliged to content myself with, because there is a chasm which my friends could not completely fill up, viz. between 1749 and 1769, was, £9 11*s*. 7¼*d*. duty, £96,532 13*s*. 2¾*d*.

It does not appear that the growth has kept pace at all with the price, since in the first four years it averaged nearly 60,000 bags; the second four years 72,500; and the last four years 77,125 bags. Now the real annual consumption, accordding to the best information I can get, is supposed to be about 80,000, leaving a deficit of 2,875 bags, which must be made up either by importation, or by the use of drugs; and then there would be no stock in hand to resort to, in case of two or three years successive bad crops.

In fact it appears that we do import largely, and that in some years our exports are a mere nothing, as I shall now shew. In 1800 we imported 6,900 cwt. and exported 5,356 cwt. leaving a balance against us of 1544 cwt.; in 1801 we imported 19,489 cwt. and exported none. In 1802 we imported 24,764 cwt. and exported 47 cwt.; leaving a balance against us of 24,717 cwt.; consequently our annual importation was upon the average of those three years, not less than 17,051 cwt. while our average exportation for the same period did not exceed 1801 cwt.; can any thing prove more strongly that our consumption does, in spite of every trick and device of the brewer, greatly exceed our growth?

On every ground therefore of sound policy, it would surely be wisdom in the government of this country, instead of lessening the growth of so precarious a crop as hops by excessive duties, (which, with all due submission I say it, are unjust and arbitrary, and founded upon a wrong system, because as the law now stands, one hundred weight of the worst hops, which would not sell for forty shillings, pays as much duty as one hundred weight of the best Farnham hops, that would sell for twelve pounds) by enormous tithes, or by any other discouragement whatever; and thereby obliging the dealers to encourage the growth abroad, to supply our wants at home; or driving the brewers to the necessity of poisoning his Majesty's subjects with the most nauseous drugs as a substitute; I say, would it not be wisdom, rather to offer premiums for the encouragement of their growth, and by taking the duties ad valorem, and settling some permanent mode of composition for tithes, do away the onus under which every planter in the kingdom now labours? I presume it would; and I am sensible, from the language that has been held out to me by the great growers in every part of the kingdom, that if proper encouragement was given to them, a much larger annual revenue might be drawn from hops than takes place at this time.

The first duties that were levied on hops was in the reign of Queen Anne, who levied a duty of one penny in the pound avoirdupois on all hops, see stat. 9. cap. XII. It was afterwards made perpetual by G. I. cap. XII. and a part of the aggregate fund. By subsequent statutes the duty amounts to upwards of twenty-three shillings in the pound. There was an additional duty of $1\frac{1}{4}\ \frac{3}{20}$ laid on in the year 1802. On so precarious a produce the duty cannot fail to vary considerably. I have given already a few instances of the produce selected from different periods, but as it may be more satisfactory to see the progressive amount of the duties from year to year, I have been at some pains to procure the account, with which I shall close the subject. On these facts many more remarks might be made than I have already done; but they will naturally occur to those who are fond of contemplating these subjects. There is a duty of £5 18*s.* 10*d.* per cwt. on foreign hops imported, and a drawback on exportation of £4 3*s.* 4*d.*

It appears from our statute books that every possible encouragement was given by our sovereigns to the growth of hops, for we read in one of the statutes of Edward VI. relating to inclosures, that an exception is made in favour of hop grounds, because then, and for several reigns succeeding, our dependence was principally upon those which we imported; and so ill were we used in this commodity, that in the first of King James I. a law was made for preventing frauds in the package of hops, in which it is said, that two thirds of what was brought over were sticks, stones, and dirt; so that the nation was annually cheated of more than £20,000. There is also a penal statute by which the destroying of hops while growing, has been made felony without benefit of clergy, vi G. II. chap. 37.

The season of 1803 was peculiarly favourable to the growth of hops throughout the kingdom, and it is not known that it was more so at one place than at another; yet the difference in the value and price of the Farnham hops above those of any other place is a stronger demonstration of what I have stated in the preceding account, namely of the superior skill and management manifested by the planters there, rather than in any material difference in the quality of their soil. On the 9th day of November 1803, the prices were as follow:

	Bags, per cwt.					*Pockets, per cwt.*				
	£	*s.*		£	*s.*	£	*s.*		£	*s.*
Kent ...	4	10	to	5	8	5	0	to	6	0
Sussex ..	4	10		5	4	5	5		5	18
Essex ..	4	10		5	4	0	0		0	0
Farnham	0	0		0	0	7	0		8	9

Worcester, no account.

These prices will not pay the grower without large crops.

It is somewhat remarkable in the growth of hops, that the bine invariably follows the course of the sun in its twining round the pole; whereas kidney beans, such as the scarlet and Dutch runners, honey suckles, and most other climbing plants go contrarywise to the sun.

The crop of 1804 has been very considerable, but neither quite so large, nor so fine as those of the preceding year. If my information is true, that 80,000 bags is the annual consumption of the kingdom; and that, of last year's, and especially of this year's growth, a large proportion of it is either in the hands of the grower or the merchant, I do not see how it is possible for the brewers in London to make good their assertion, (unless they still continue to use large quantities of drugs,) that they have actually bought, and have in their possession at this time full three years' consumption, for the total growth of these two years would not at this time afford two years' consumption, at least so far as my information leads me to believe from repeated conferences with most of the factors in the Borough.

Annual Amount of the Hop Duty for 92 years to 1801.

	£	s.	d.		£	s.	d.		£	s.	d.
1711	43,437	16	1	1746	91,879	19	6	1774	138,887	1	0
1712	30,278	16	0	1747	60,000	0	0	1775	41,597	0	3
1713	23,018	12	1	1748	87,000	0	0	1776	125,691	0	0
1714	14,457	5	11	1749	36,305	19	1	1777	43,581	13	2
1715	44,975	7	6	1750	65,000	0	0	1778	159,891	2	10
1716	20,354	16	5	1751	73,954	0	0	1779	55,800	0	0
1717	54,669	2	8	1752	79,000	0	0	1780	122,724	4	4
1718	15,005	15	8	1753	81,000	0	0	1781	120,218	9	10
1719	90,317	19	0	1754	112,000	0	0	1782	14,895	12	6
1720	38,169	15	7	1755	82,157	0	0	1783	75,716	14	4
1721	61,362	6	5	1756	48,106	0	0	1784	94,359	17	8
1722	49,443	0	4	1757	69,713	0	0	1785	112,684	5	9
1723	30,279	9	6	1758	72,896	0	0	1786	95,973	14	8
1724	61,271	7	2	1759	42,115	0	0	1787	42,227	3	4
1725	6,526	8	3	1760	117,992	12	4	1788	143,168	0	0
1726	85,013	13	9	1761	79,776	13	6	1789	104,063	7	4
1727	69,409	2	10	1762	79,295	14	1	1790	106,841	9	4
1728	42,494	8	9	1763	88,315	16	7	1791	90,059	1	10
1729	48,441	0	0	1764	17,178	1	4	1792	162,112	19	5¼
1730	44,419	16	8	1765	73,778	7	6	1793	22,619	13	4¾
1731	22,600	0	0	1766	116,445	14	6	1794	203,063	2	0¾
1732	35,135	0	0	1767	25,997	9	8	1795	82,342	19	5
1733	70,000	0	0	1768	114,002	0	0	1796	75,223	17	8
1734	37,416	0	0	1769	16,201	11	7	1797	157,458	11	10¼
1735	42,745	0	0	1770	101,131	2	11	1798	56,032	1	6¾
1736	46,482	0	0	1771	33,143	5	5	1799	73,279	15	3
1737	56,492	10	6	1772	102,650	4	2	1800	72,928	7	5½
1738	86,575	17	6	1773	45,847	12	10	1801	241,227	8	5¾
1739	70,742	6	7								
1740	37,875	12	2								
1741	65,222	8	4								
1742	45,550	15	1								
1743	61,072	12	9								
1744	46,708	12	9								
1745	34,635	0	0								

		£	s.	d.	£	s.	d.
1802	old duty	15,463	10	5¾	33,616	7	1¼
	additional	18,152	16	7½			
1803	old duty	199,205	1	10¼	433,054	11	0
	additional	233,849	9	1¾			

Calculation of the Hop Duty, per cwt.

	Original duty 1*d.* per lb.	0	9	4	
	Three 5 per cents. on ditto	0	1	4¾	$\frac{4}{20}$
1802, April 30	New duty 1¼ $\frac{8}{20}$ per lb.	0	12	7	$\frac{16}{20}$
	Total per cwt.	£1	3	4	

END OF VOLUME SECOND.

C. and R. Baldwin, Printers,
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